Chapter 188

November 1992

Massachusetts Educational Assessment Program

The Massachusetts Educational Assessment Program

1992 Statewide Summary

Massachusetts Department of Education

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by Elizabeth Badger

Massachusetts Department of Education

Foreword

Education is one of the most precious heritages that we can leave our children. It allows them to function effectively in a complex world that demands the ability to think critically, creatively and flexibly. It gives them the power to solve problems in the workplace and in their personal lives. It introduces them to the challenges and pleasures of intellectual discovery.

As educators, we assume the responsibility for providing this heritage for all students. In a world of ever-changing demands and challenges, creative responses are called for. We also need a constant monitoring of progress so that we can respond to situations in an effective and timely manner. We must be aware, not only of how well students are performing, but of the factors that enhance or impede their growth in learning.

This report is intended to support educators by detailing the current achievement of students throughout the state and by providing information about the context in which education is carried out. The information contained is specific and explicit. It is meant for discussion and deliberation as it presents issues of concern to the educational community. We hope that its contents will be the occasion for discussion, self-reflection, and, ultimately, action among those who care.

Robert V. Antonucci

Robert V. Antonucci,
Commissioner of Education

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Overview

Introduction

This report of the results of the 1992 Massachusetts Educational Assessment Program is based on the responses of over 155,000 students in grades 4, 8, and 12. Each student participating in the assessment answered a series of open-ended and multiple-choice questions designed to measure his or her knowledge and understanding of mathematics, science, and social studies, as well as skill in interpreting written material and communicating ideas in written form. Background information was also collected from students, their teachers and principals.

The resulting analysis attempts to describe, not only the achievement of student throughout Massachusetts, but the factors that may impede or enhance that achievement. In addition, it looks at variability in performance by examining conditions in two sets of schools within the Commonwealth. Finally, it points to areas of concern for possible policy considerations.

Major Findings from the Massachusetts Educational Assessment Program

Achievement

- **Average scaled scores rose in 1992, particularly at the fourth and eighth grade levels. Compared with results in the two previous administrations, the present assessment indicates improvement in overall achievement among all grade levels.**
- **Analysis of student performance according to levels of proficiency indicates that approximately one-quarter of the students display an understanding of the underlying principles of the grade-appropriate curriculum, and an ability to apply their understanding in a variety of contexts. In contrast, two-thirds find difficulty in applying the knowledge and skills that they learn in the classroom; while an average of 10% of students can be classified as failing to achieve a level of "basic competency."**

Student Factors

- Several factors related to home environment are related to achievement. Included are: parents' completion of high school, primary use of another language in the home, ownership of books and computers, preschool attendance.
- Activities outside the home that are associated with achievement are: reading for pleasure, television viewing, time spent on homework, and part-time employment among twelfth graders. The extent of employment has decreased substantially over the past two years.
- At grade twelve, the most significant factor in relation to achievement is course-taking and program enrollment.
- At the eighth grade level, there are major differences in attainment between boys and girls at the higher levels of proficiency. Whereas girls outnumber boys in the area of reading, boys excel in science and social studies. At level 4, the difference favoring boys in science is 32% and in social studies, 23%.
- Differences in attainment between boys and girls increase by twelfth grade. Twenty-two percent more boys than girls are reading below level 1. At the other extreme, there are 27% more boys at level 4 in mathematics, 26% in science, and 20% in social studies.

School Factors

- In 1992, the majority of teachers in Massachusetts schools have had more than 20 years experience. Among twelfth grade social studies teachers, this figure rises to 68%.
- Female teachers predominate among fourth grade teachers. Male teachers predominate among twelfth grade science teachers, and social studies teachers of both eighth and twelfth grades. At all levels, most principals are male.

- **Teachers report relatively fewer resources in 1992 as compared with the previous assessment, and class size is seen as more of a problem.**
- **More teachers are employing active learning techniques in their classrooms and fewer school systems are tracking their students by ability.**
- **Calculator use has increased in mathematics classes, particularly at the twelfth grade level.**

Differences Among Schools

Dramatic differences were found to exist in:

- **The extent of poverty, transiency, unfamiliarity with English, and lack of home resources that students must cope with.**
- **The range and degree of behavioral problems that schools must cope with.**
- **The resources afforded to schools in order to promote education.**

It appears that those schools with the greatest challenges in promoting an educational environment are also those with the least resources provided.

Chapter One describes the program and the procedures for collecting the data. **Chapter Two** describes the overall level of achievement attained by students throughout the state. **Chapter Three** examines some of the student variables that are related to performance. **Chapter Four** describes the context for schooling as described by teachers and principals. Finally, **Chapter Five** discusses some of the inequities that exist among schools throughout the state.

The major results described above are presented in more detail and depth throughout this report. In addition, an **Appendix** gives detailed descriptions of the Proficiency Levels, as well as students' actual responses to questions in all the subjects tested. Taken as a whole, this report is intended to serve as a context for discussion about the factors that affect performance and an impetus for the action required to improve education for all students throughout the state.

CHAPTER 1 *Massachusetts Educational Assessment Program*

Introduction

The Massachusetts Educational Assessment Program (MEAP) was established by Chapter 188 of the Acts of 1985. Its purpose is to furnish information to improve curriculum and instruction in Massachusetts schools, and to provide reliable results for comparisons at the school, district, state, and national levels. Since 1986, it has been administered biennially to all students at three grade levels.

The 1992 assessment was the fourth round of MEAP testing. In the course of the seven years of its administration the program has evolved in response to different educational concerns. A brief history of the assessment is as follows:

1986

Students in grades 3, 7, and 11 were assessed in reading, mathematics, and science.

School and district results were reported in terms of scale scores, with a state mean of 1300 and a standard deviation of 100.

A report comparing Massachusetts scores to those achieved on the National Assessment of Educational Progress was published in 1987.

1988

Grade levels were changed to 4, 8, and 12 in order to conform with a revised testing schedule of the National Assessment for Educational Progress, and social studies was included among the subjects covered.

A sample of students completed open-ended (essay type) questions in each subject area. Results were published in a series of books entitled, *On Their Own*.

A report comparing Massachusetts scores to the National Assessment of Educational Progress was published in 1989.

1989

A sample of students at grades 4 and 8 completed a set of practical, problem-solving tasks in mathematics and science. Results were published in a booklet entitled *Beyond Paper and Pencil*.

1990

A more extensive set of open-ended questions was included in the test and results were included in the school and district reports for informational purposes.

Proficiency levels based on multiple-choice results were introduced in the school and district reports.

1992

All students completed open-ended questions in each subject area. Approximately one-third of the questions were scored for quality of communication (Writing), in addition to content knowledge. The results constitute 30 percent of school scores.

Proficiency levels, based on both open-ended and multiple-choice results, replace scaled scores as the primary method of reporting results.

National comparisons are achieved through the National Assessment of Educational Progress's State-by-State assessment.

The 1992 statewide assessment was administered in January to grade 12 students and in April to students in grades 4 and 8. The only students excluded from the MEAP tests were those exempted as special education students (primarily students in special education categories 501.3 and 501.4), students in transitional bilingual programs for 3 years or fewer, or those who had been absent from school during testing and make-up sessions. Over 155,000 Massachusetts students (89% of students in the designated grade levels) completed the tests, as the chart below illustrates.

	Grade 4	Grade 8	Grade 12
Special Education	4677	4093	2403
Bilingual	1279	699	1131
Regular Education	52014	47067	42300
Total	57970	51859	45834

Number of Students Included in Reports

Test Development, Scoring and Reporting

The goal of the assessment—to provide school and district results, rather than scores for individual students—guides test development, administration, and reporting decisions.

Test Framework

The Assessment Framework was initially based on the framework used by the National Assessment for Educational Progress, with validation from a curriculum survey which was sent to all schools throughout the state. Since 1986, this framework has been modified in light of curriculum reform efforts by such organizations as the National Council of Teachers of Mathematics, and the Massachusetts Reading Association. A complete description of the framework, as well as test questions, is presented in *Description of Test Content and Reporting Categories*.

Test Format

Because the assessment does not report on individual student scores, it can cover a broad range of student knowledge and abilities, from basic to higher order skills, in all the subjects assessed. The total number of questions is divided into several forms per grade, with each student completing one form. The total number of questions completed by students at each grade level is as follows:

	Multiple-Choice Questions			Open-Ended Questions		
	Grade 4	**Grade 8**	**Grade 12**	**Grade 4**	**Grade 8**	**Grade 12**
Reading	160	222	282	12	12	12
Mathematics	220	291	380	12	13	12
Science	220	255	361	12	12	12
Social Studies	220	270	380	12	12	12
Writing				18	20	18

Number of Questions Completed

Questionnaires

In addition to the cognitive items, all students, their teachers and principals complete questionnaires. Students are asked questions about their school and personal activities, their attitudes toward the subjects, and their future aspirations. Teacher questionnaires explore activities and curriculum within the classroom. Principal questionnaires pertain to schoolwide variables affecting education, such as school resources, course offerings, and problems facing the school.

Scoring

The multiple-choice questions and half of the open-ended questions were scored by the contractor. The other half of the open-ended questions (approximately 375,000 responses) were scored by Massachusetts teachers throughout the state. In order to insure consistency of scoring, lead teachers received training by the contractor, and then trained others in a series of 20 Friday-Saturday sessions. Approximately 700 teachers participated in the scoring sessions, which were generally regarded by schools and teachers as a worthwhile opportunity for professional development.

Curriculum Advisory Committees

The Department is guided in its efforts by a Curriculum Advisory Committee in each of the subject areas tested. These committees, composed of teachers and curriculum coordinators from a representative sample of schools throughout the state, participate at all levels of the testing process and serve to validate the content and interpretation of the assessment. In past years, they guided the development of the assessment framework, reviewed and revised test questions, and interpreted results. During the current administration, they assumed primary responsibility for the development of the open-ended questions and their scoring rubrics, reviewed the results, and determined the standards for the proficiency levels.

Reporting of Results

Results are reported using two types of statistics. The first, scaled scores, is designed to compare the average achievement results of schools and districts throughout the state. The second, percentages of students at each proficiency level, is designed to describe how students actually perform. Scaled scores have been traditionally used in reporting MEAP results; however, in 1992 emphasis is being placed on proficiency levels because of their greater clarity in communication.

Data from the Massachusetts Educational Assessment Program are released in a variety of ways that are designed to assist schools in curriculum evaluation and improvement. School and district reports provide detailed information on student performance, as

well as information on trends in achievement. *Using the School Report*, delivered with the school and district reports, explains how to use MEAP data to examine school programs and facilitate curriculum improvement. *Descriptions of the Proficiency Levels* is designed to serve as a model for teachers' own evaluation efforts, as is a separate report on written communication skills, entitled *Writing Across the Curriculum*.

Assistance to Schools

In addition to its publications, the Massachusetts Educational Assessment Program is actively engaged in promoting professional development in evaluation and assessment. During the coming year, it will be working with a group of schools in developing procedures for portfolio assessment. It will also be developing and sponsoring statewide workshops designed to promote the use of evaluation in the service of instruction.

CHAPTER 2 *Overall Level of Achievement*

Introduction

In order to increase the utility of the assessment results, achievement data has been reported using two types of statistics: scaled scores and proficiency levels.

Scaled Scores: Statewide Average of School Scores

Since the inception of the assessment program, scaled scores have been used to report the average attainment achieved by schools and districts in each of the subject areas tested. In deriving such scores, raw scores on different tests are converted to a common scale which has the same mean and standard deviation. This procedure effectively standardizes the level of difficulty among the separate tests and allows for meaningful comparisons among districts/schools and between different testing administrations.

In 1988, the statewide average was set at 1300, with a standard deviation of 100 points. Individual school and district scores fell within a range of 1000 to 1600. In 1990, scores for grades 4 and 8 rose minimally in some subject areas; however, the present assessment indicates that the improvement in overall achievement is continuing across the subject areas at all grade levels. Furthermore, in some content areas and grade levels, this rise can be considered educationally significant.

	Grade 4	Grade 8	Grade 12
Reading	1330	1330	1320
Science	1330	1340	1320
Social Studies	1330	1320	1310
Mathematics	1330	1340	1320

MEAP State Averages

Proficiency Levels: Descriptions of Student Performance

As noted above, scaled scores are a summary statistic, derived for the purposes of comparison only. They give no information about what students can and cannot do. Proficiency levels, on the other hand, are a descriptive statistic. By describing the actual performance of students, they provide a profile of student achievement within the state, the districts and the schools. Because of their close connection to the recognized objectives of the curriculum, they have the potential of functioning as:

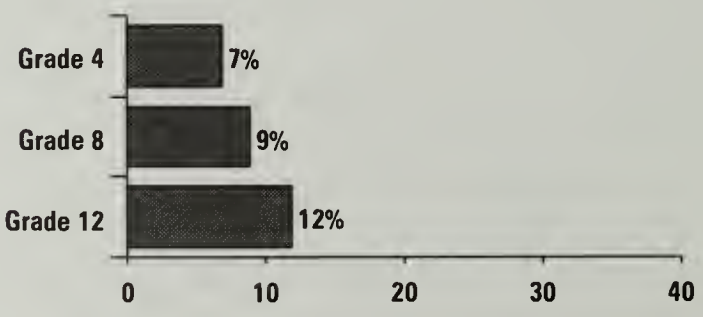
- **Standards or goals for the improvement of curriculum and instruction**
- **Vehicles for communicating to teachers, parents and the general public the nature of student achievement**
- **Guidelines for the classroom evaluation of individual students**

The description of these proficiency levels relies heavily upon the work of the Curriculum Advisory Committees, which reviewed and evaluated students' work. Although only open-ended responses are used in the examples contained within this report, students' responses to the multiple-choice, as well as the open-ended questions, were used to determine the four levels. More detailed descriptions and examples of student responses at each of the proficiency levels, as well a discussion of the process by which they were derived, are provided in Appendix A. Although specific details differ among grade levels and subject areas, the brief descriptions below reflect the commonality that exists within each level.

Statewide Percentage of Students at Each Level for All Students

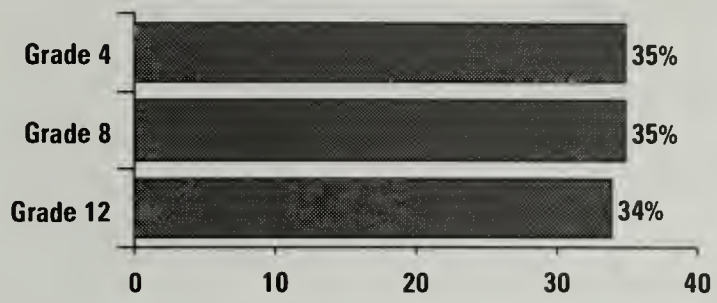
The graphs below report the percentage of students at each level of proficiency.

Below Level 1 are students who were able to respond to very few multiple-choice questions and were unable to interpret or respond to open-ended questions.



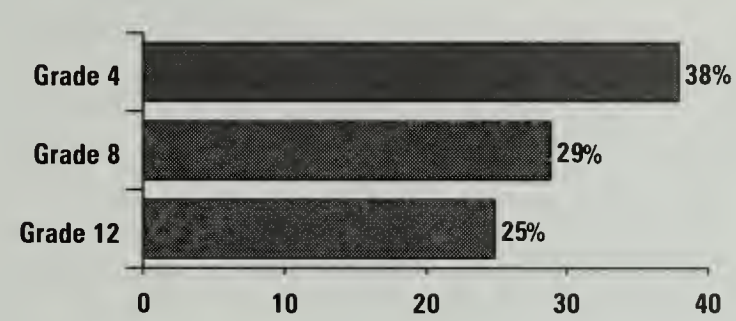
Percentage below Level 1

Level 1 describes students who are sometimes termed at the "novice" level of learning. These students are capable of responding to simple, familiar material which is presented in a highly structured format (i.e., multiple-choice questions), but fail to recognize the requirements of unfamiliar tasks.



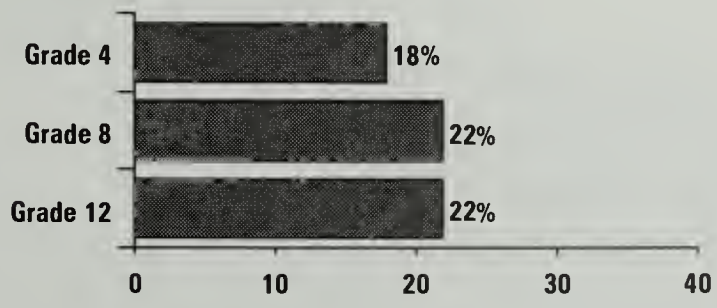
Percentage at Level 1

Level 2 describes students who are have mastered the basic components of the grade-appropriate curriculum. They respond adequately in response to structured questions; however, when asked to generate their own response, their responses seldom go beyond the minimally acceptable and may indicated major misconceptions.



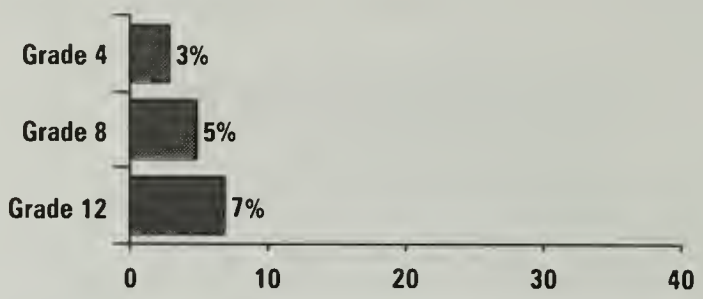
Percentage at Level 2

Level 3 describes students who are have mastered the underlying principles of the grade-appropriate curriculum. They reason and communicate clearly, and can apply their knowledge in a variety of contexts.



Percentage at Level 3

Level 4 describes students who possess a broad and detailed base of knowledge that goes beyond the traditional curriculum. Their analytical ability is sophisticated for their age level, as is their ability to communicate their reasoning.



Percentage at Level 4

The tables below give more detailed information on students' performance in the subject areas tested.

	Below Level 1	Level 1	Level 2	Level 3	Level 4
Reading	9	32	36	20	3
Science	5	41	34	18	2
Social Studies	7	37	37	17	2
Mathematics	6	38	39	15	2
Writing	6	26	46	19	4

Grade 4

	Below Level 1	Level 1	Level 2	Level 3	Level 4
Reading	13	30	26	24	7
Science	7	38	24	27	4
Social Studies	8	39	26	22	5
Mathematics	8	39	29	19	6
Writing	9	27	42	18	4

Grade 8

	Below Level 1	Level 1	Level 2	Level 3	Level 4
Reading	15	29	27	19	10
Science	10	38	21	25	6
Social Studies	9	41	21	25	5
Mathematics	12	37	24	20	7
Writing	14	24	34	22	6

Grade 12

Average Percentage of Students at Each Proficiency Level for Different Categories of Students

Between two and three times as many special education students as regular students performed below Proficiency Level 1. The percentage of students in this category is greatest in the area of reading at the twelfth grade level. Here, 34% of special education students are below the lowest proficiency level, as compared with 29% at grade 8 and 18% at grade 4.

	Below Level 1	Level 1	Level 2	Level 3	Level 4
Grade 4	13	45	30	9	1
Grade 8	20	48	22	9	1
Grade 12	26	45	18	9	2

Special Education Students

	Below Level 1	Level 1	Level 2	Level 3	Level 4
Grade 4	31	46	18	5	1
Grade 8	23	39	21	14	3
Grade 12	28	37	18	14	3

Bilingual Students

The term "Bilingual Students" refers to those students who have attended a bilingual program for more than three years. These students represent between 1% and 2% of students reported. A close analysis of their results indicates that they perform least well in reading and social studies, which relies heavily upon reading skills. Across the three grades, approximately 37% of students read below Reading Proficiency Level 1, signifying that they can recognize only simple literal details in texts and are unable to supply their own responses to open-ended questions.

	Below Level 1	Level 1	Level 2	Level 3	Level 4
Grade 4	5	34	40	19	3
Grade 8	8	33	30	23	5
Grade 12	11	33	26	23	5

Regular Education Students (not in categories above)

Possibly because of increasing differences in course content, the range of proficiency becomes attenuated as students progress through their schooling. For example, among regular education students twice as many are performing below Level 1 at grade 12 as at grade 4; while three times as many are performing at the Level 4 proficiency.

Summary and Conclusions

The differences between scaled scores and proficiency levels is dramatically illustrated in these results. Although the average performance achieved by students has risen in many areas over the past four years, when levels of performance are described, results are less encouraging. The profile of student performance presented in this chapter, in conjunction with the detailed descriptions found in the Appendix, can provide a context for meaningful discussion of standards of achievement and expectations for the future.

CHAPTER 3 *Massachusetts Students*

Introduction

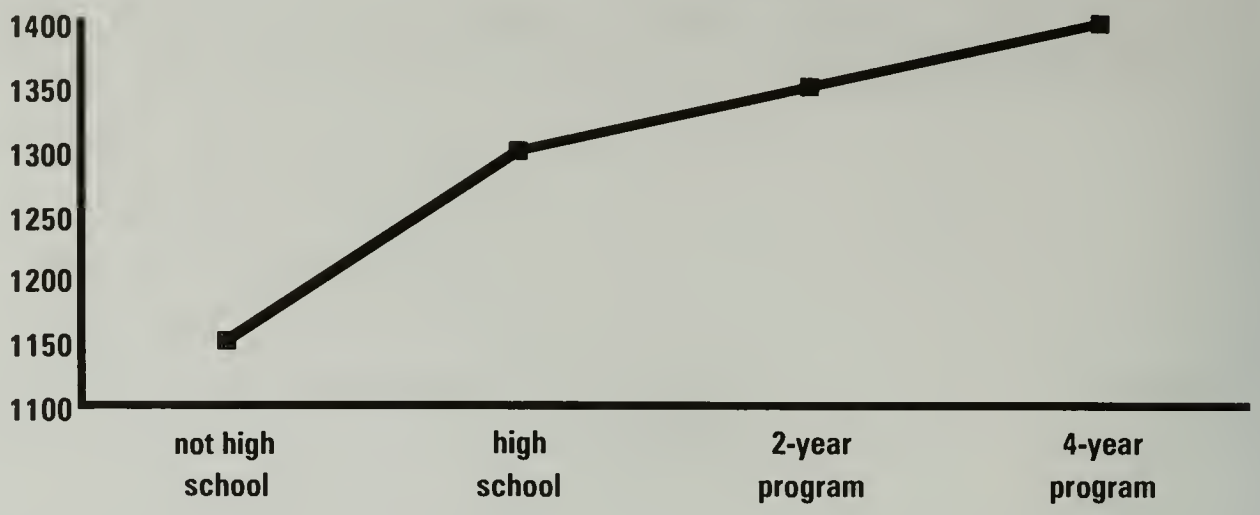
All students who participated in the Massachusetts Educational Assessment Program provided some information about their backgrounds, attitudes toward learning, and activities both inside and outside the classroom. At grade 4, all students responded to a common questionnaire composed of 22 items; the material was read aloud to students, and teachers could assist in clarifying questions or answer choices if the students requested such help. At grades 8 and 12, students independently completed one common questionnaire for each grade level, and several different forms of a second questionnaire which focused on the different subjects tested in the assessment. Data from these student questionnaires give insight into student attitudes and factors that affect learning.

Home Background

Schools do not operate in a vacuum. Each student brings a unique culture and set of experiences, which differ in the extent to which they reinforce the experience of schooling. The most powerful of these personal background factors are discussed below.

Parental Education

- **Approximately 48% of eighth and twelfth grade students' fathers (or male guardians) and 41% of their mothers (or female guardians) have completed a post-secondary educational program.**
- **11% of eighth and twelfth grade students' parents or guardians have not finished high school.**
- **Patterns of response at grades 8 and 12 were similar and were virtually the same as responses given in previous years.**



Grade 12 Achievement and Parental Education

As the graph above indicates, the level of their parents' education is highly related to students' own levels of achievement in school. However, it must be stressed that although this association is strong and persistent, it represents a trend, not an absolute. For example, although 62% of students at the top proficiency level in mathematics, science and social studies report that their male guardians graduated from college, approximately 21% of the students at that level report that their guardians only completed high school. Furthermore, 22% of students reporting high parental education performed below Level 1 on the assessment. Similar statistics and associations hold for grade 8 students.

Home Language

- **English is the only language spoken in the homes of about 66% of fourth and eighth grade students and 72% of twelfth graders.**
- **Languages other than English are spoken "most of the time" or "always" in approximately 13% of the homes.**

The extent to which a language other than English is spoken in the home is also related to achievement, although the association is more complex than that of parental education. Students who come from bilingual families who use English as the primary language do not differ in achievement from those students whose families speak English exclusively. However, students who report that a language other than English is spoken "most of the time" or "always" perform significantly less well than their peers.

Book Ownership

- **Book ownership decreases as students progress in schooling. Whereas 70% of fourth graders reported that they owned more than 30 books (excluding textbooks and comics), only 55% of eighth graders and 40% of twelfth graders reported a similar level of ownership.**
- **17% of twelfth graders own fewer than 5 books. At fourth grade and eighth grade the percentage is 6% and 10%, respectively.**

Ownership of books is strongly related to achievement, particularly at the fourth and eighth grade levels. At grade 8, 73% of students in the highest proficiency level own more than 30 books, in contrast to 37% of students at the lowest level.

Attendance at Preschool, Nursery or Day School

- **71% of fourth grade students report that they attended some type of preschooling program; 22% did not; while 7% replied that they were unsure.**

Students who participated in a preschooling program were twice as likely to achieve at the highest level of proficiency. Conversely, students who reported that they did not attend were three times as likely to function below proficiency Level 1.

Computer Ownership

- **43% of fourth graders, 49% of eighth graders, and 46% of twelfth graders have access to a computer at home.**
- **At fourth grade, students use their computers mainly for games, but these computers are increasingly used for homework as students mature.**

Computer usage is probably related to relative affluence. For example, at the fourth grade level there is little evidence that the use to which computers are put (e.g., for games versus for school work) has any effect on achievement. Nevertheless, a lack of

access is related to achievement; among fourth grade students who do not have access to a home computer, 72% performed below Level 1, compared with 37% at Level 4.

The difference is comparable at grade 8, but becomes related to type of usage. Students in the higher proficiency levels not only have access to computers, but tend to use them for homework. By grade 12, the difference in achievement between those with and without access becomes more pronounced. Whereas 68% of students who are performing below Level 1 do not have a computer, only 23% of Level 4 students do not have one. Furthermore, 60% of Level 4 students use their computers for homework.

Activities Outside of School

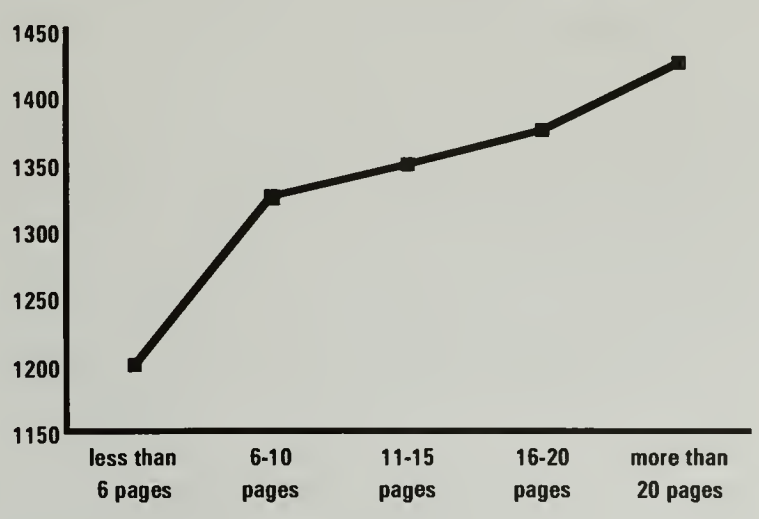
Activities that students engage in outside of school differ in the extent to which they reinforce the learning that takes place in the classroom. The most common, or the most influential, are discussed below.

Reading for Pleasure

- **More than half of grade 4 students read for pleasure on a daily basis.**
- **At grade 8, 43% spend at least 2 hours during the week reading for their own purpose or for fun.**
- **By grade 12, while approximately a quarter of the students report that they read for pleasure on a daily basis, 34% read no books for their own interest during the month before the assessment.**

Reading at home (in distinction from reading at school) is related to achievement, particularly at the lower grade levels. Among fourth graders who read on a daily basis, almost twice as many students are in the highest versus the lowest proficiency level.

At the eighth grade level, three-quarters of the students who perform below Level 1 proficiency read one hour a week or less, in contrast to 30% of students who performed at Level 4. Although the trend is similar at grade 12, the differences are less dramatic. On the other hand, among twelfth graders, the amount read for school work is strongly related to achievement, as the graph on the next page indicates.

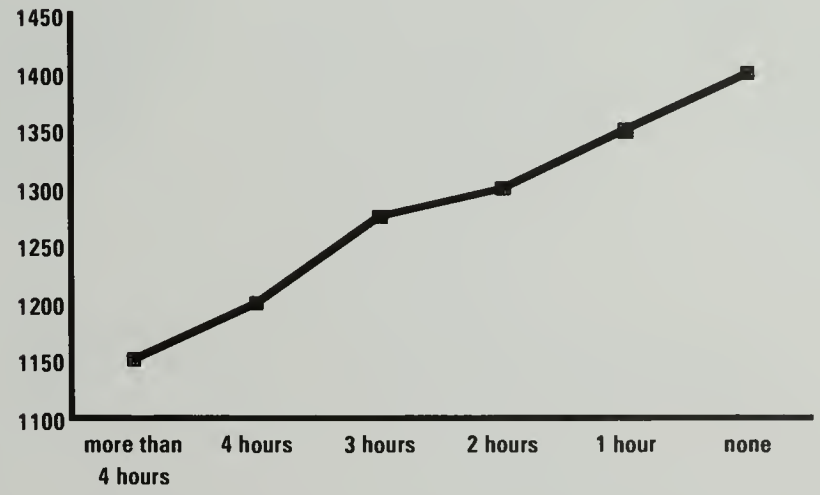


Relationship between reading for school work and achievement among twelfth graders

Television Viewing

- **41% of grade 4 students watch 2-3 hours of television each day and 33% of them watch television for 4 or more hours each day.**
- **Approximately half of eighth and twelfth graders watch television for 2-3 hours daily. 24% of eighth grade students and 13% of twelfth grade students report watching television for 4 hours or more per day.**

The amount of time that students spend watching television is inversely related to achievement levels, particularly when students watch beyond 3 hours a day. The graph below portrays the relationship.



Twelfth grade attainment and television watching

Homework

- **34% of fourth graders spend one hour a day on homework, while 54% spend 1/2 hour or less and 12% spend more than an hour.**
- **45% of eighth grade students spend one hour a day on homework. 26% spend less time, while 28% spend more than an hour.**
- **At the twelfth grade level, 24% of students spend one hour. The number of students spending less than one hour rises to 34%, while 41% spend more than one hour. Twelfth graders spend most time on reading/literature assignments: 20% spend from 2-4 hours a week; a further 11% spend more.**

Fourth grade students who spend approximately an hour a day on homework are more likely to perform at higher proficiency levels, although more time is not strongly related to achievement. At the other grade levels, the largest difference in performance is seen by eighth grade students who spend between 1 and 2 hours and by twelfth grade students who spend between 2 and 3 hours a day.

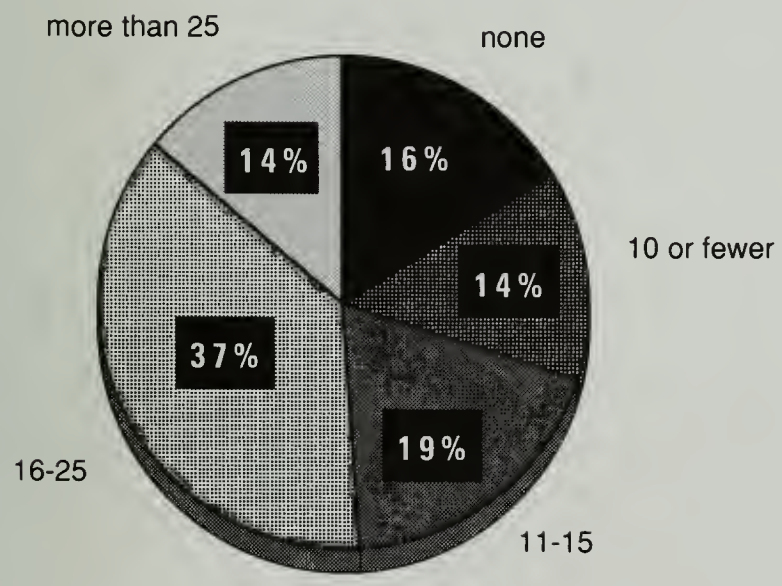
Part-Time Employment

- **Approximately 70% of twelfth graders work at some type of job after school or on the weekend.**
- **While 31% of twelfth grade students do not work at all, 7% work for more than 25 hours a week.**

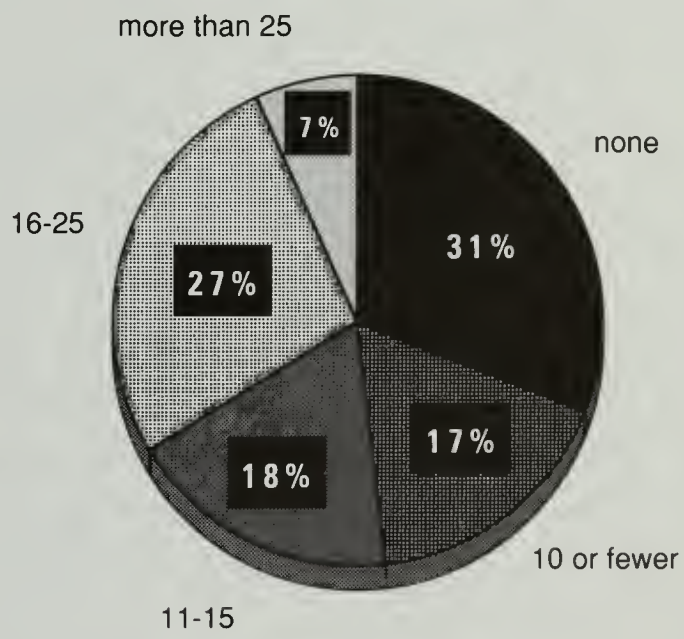
Related to the amount of time spent on homework is the time spent on part-time employment. Students who engage in a limited amount of part-time work (less than 10 hours a week) perform better on the assessment and are more likely to be represented in the higher levels of proficiency than students who do not work at all. For others, the time spent in employment is inversely related to achievement.

The percentage of students NOT working has dramatically increased in the past four years. In 1988, only 16% of the students were not employed in any kind of part-time work, while 51% worked at least 16 hours a week. In 1992, 31% of students reported that they did not work and the percentage working more than 16 hours declined to 34%.

1988



1992



Hours Per Week Working, Exclusive of Vacations

Course Enrollment

Eighth grade enrollment in mathematics:

Algebra	29%
Pre-algebra	38%
General	32%
Remedial	1%

Over the past 2 years there has been a slight (5%) increase in the number of students taking algebra, and a corresponding decrease in the number who described their course as "general."

Twelfth grade enrollment in English:

AP or Honors	17%
College Preparatory	52%
Regular	27%
Other	3%

Twelfth grade enrollment in Mathematics (current or last):

General/Business	15%
Geometry/Algebra	20%
Advanced Algebra	15%
Trigonometry	18%
Pre-Calculus/Calculus	24%
None of the above	8%

Twelfth grade enrollment in American History:

AP or Honors	22%
College Preparatory	46%
General	28%
None since 9th grade	3%

Twelfth graders reporting one or more years of science:

Biology	86%
Chemistry	62%
Physics	29%

At the twelfth grade level, the most dramatic relationship between student factors and achievement on the assessment test is not parental education or language, but the actual course followed by the student. The 66% of twelfth grade students who follow an academic curriculum perform significantly better than those who follow a general or vocational educational course and represent almost all students in the higher levels of proficiency. Although vocational and general education students comprise 33% of the population, they represent only 7% of students at Level 4 and 15% of students at Level 3.

Attitudes, Perception and Achievement

The relationship between attitudes and achievement is not clear. For example, research has shown that "liking" a subject does not lead to successful performance, although there is no question that positive attitudes toward a subject increase students' motivation to engage in it. On the other hand, how a subject is perceived does give teachers a clue to more effective instruction. It is for this reason that students were asked about their perceptions and behaviors regarding the different subject areas tested.

The Attitudes of Fourth Grade Students

- **96% of fourth graders believe that their teachers expect them to do well most of the time.**
- **66% of fourth graders agree that they like to come to school most of the time, while 9% disagree strongly.**
- **Fourth grade students enjoy mathematics more than science: 36% state that math is their favorite subject in contrast to 16% for science.**

At the fourth grade level strong liking for a particular subject does not seem to be associated with actual achievement. Instead, positive attitudes toward a range of school subjects is more highly related to achievement.

Eighth and Twelfth Grade Students' Attitudes Toward Reading

- **When asked if they experienced difficulty in understanding the textbooks used for various subject areas, approximately 30% of eighth graders replied in the affirmative, whether with reference to literature, science or social studies.**

Among eighth graders, over half of the students who function below proficiency Level 1 and almost 40% at proficiency Level 1 state that they encounter difficulty with their science textbooks, compared with 9% of students at proficiency Level 4. This general pattern is evident in all subject areas. In addition, it may be exacerbated by the fact that students at the lower levels of proficiency are less likely to be asked to read extra material that is not in the standard text. Consequently, the general knowledge base that is characteristic of students at the higher levels of proficiency is not available to such students.

Eighth and Twelfth Grade Students' Attitudes Toward Mathematics

Percentages of students who perceive Mathematics as:

	Grade 8	Grade 12
Very useful in everyday life	37%	—
Very interesting	28%	21%
Difficult	47%	62%
Mainly memorizing	58%	48%
A set of unrelated topics	24%	—

Students who are at the highest proficiency level are almost twice as likely to answer that they are very interested in mathematics. On the other hand, relative proficiency in mathematics does not seem to affect students' perceptions of how difficult it is. Although more students at Levels 1 and 2 find mathematics difficult, so do 35% of twelfth grade students who perform at Level 4.

More relevant to achievement is students' perception of the nature of mathematics. When presented with the statement, "mathematics is made up of a lot of unrelated topics," 67% of eighth graders at proficiency Level 4 disagreed, in contrast to 21% of those students scoring below Level 1. Furthermore, among both eighth and twelfth graders, students at the lower proficiency levels were approximately twice as likely to see mathematics as mainly memorizing.

Eighth and Twelfth Grade Students' Attitudes Toward Science

Percentages of students who perceive Science as:

	Grade 8	Grade 12
Very useful in everyday life	22%	—
Very useful in understanding world	40%	29%
Very interesting	28%	23%
Difficult	48%	68%
Mostly memorizing	47%	43%
Unrelated topics	29%	—

Students at the lower levels of proficiency are twice as likely to perceive science as a set of unrelated topics as students at Level 4. They are also more likely to find it difficult. However, the most significant relationship lies in how interested students are in science. Among eighth graders in the highest proficiency level, 56% state that they are very interested in science, as compared with 38% at Level 3, 26% at Level 2, and 18% at Level 1 and below. Similar differences occur when students are asked whether they find science useful in understanding the world about them. Finally, it must be noted that the extent to which students actually engage in scientific procedures (i.e., laboratory work) is related to their achievement.

Eighth and Twelfth Grade Students' Attitudes Toward Social Studies

Percentages of students who perceive Social Studies as:

	Grade 8	Grade 12
Mostly memorizing	60%	57%
Very useful in everyday life	21%	—
Very useful in understanding world	45%	33%
Difficult	—	52%

In addition, approximately 23% of eighth and twelfth graders state that they perceive History as very interesting.

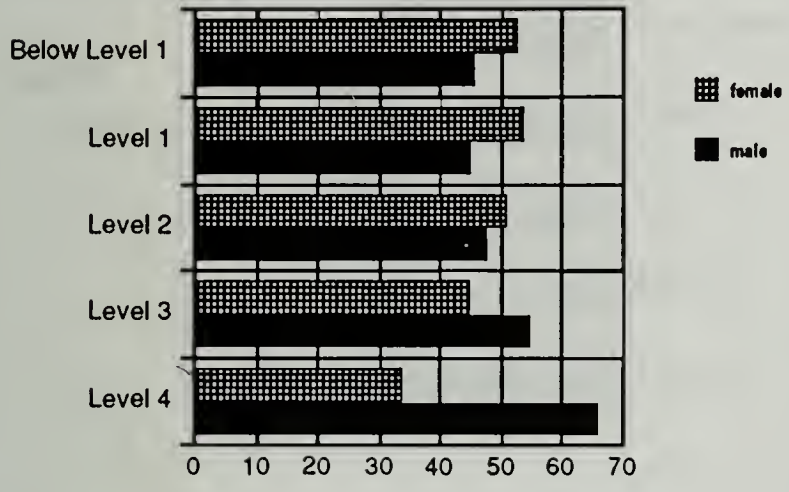
Achievement in social studies does not affect students' perception of it as a subject that is primarily dependent upon memorization. More than half the eighth grade students at every level of proficiency believe that Social Studies involves mainly memorizing. In contrast, achievement in History is related to the degree to which students find it interesting. Almost half the students at proficiency Level 4 are very interested in History, in contrast to approximately 15% at Level 1 and below.

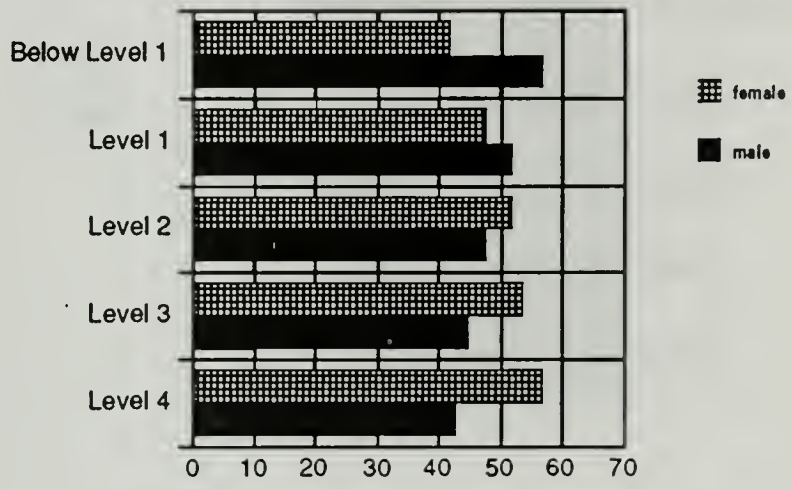
Gender Differences, Grade 8

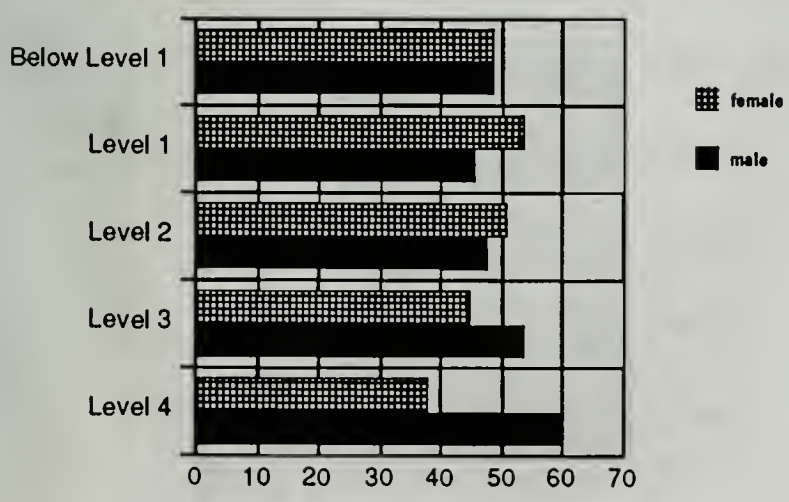
With the exception of Reading, in which 15% more boys than girls failed to attain the lowest level of proficiency, the major differences in attainment between eighth grade boys and girls is at Levels 3 and 4. At the highest level of proficiency in reading, girls outnumber boys by 14%; whereas in science and social studies, boys outnumber girls by 32% and 23%, respectively.

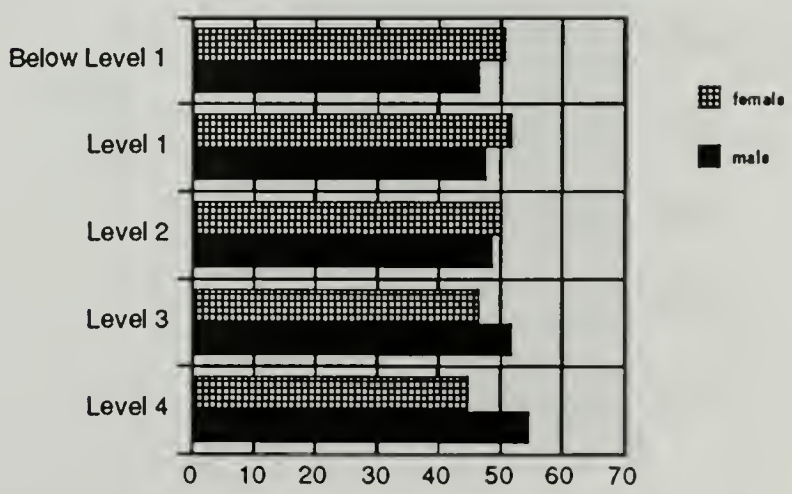
Students' responses to the questionnaires indicate that boys find history more interesting than girls; furthermore, 35% of girls, in contrast to 26% of boys, find difficulty understanding their social studies textbooks. This is a puzzling note in light of girls' generally higher reading achievement.

Practical experience, in addition to interest, may be related to the higher achievement of boys in science. When asked, twice as many boys as girls had used an electrical meter (38% versus 19%) and over a quarter more boys than girls had attempted to fix something mechanical or electrical (83% versus 57%). Overall, this kind of experience is associated with achievement on the science assessment.









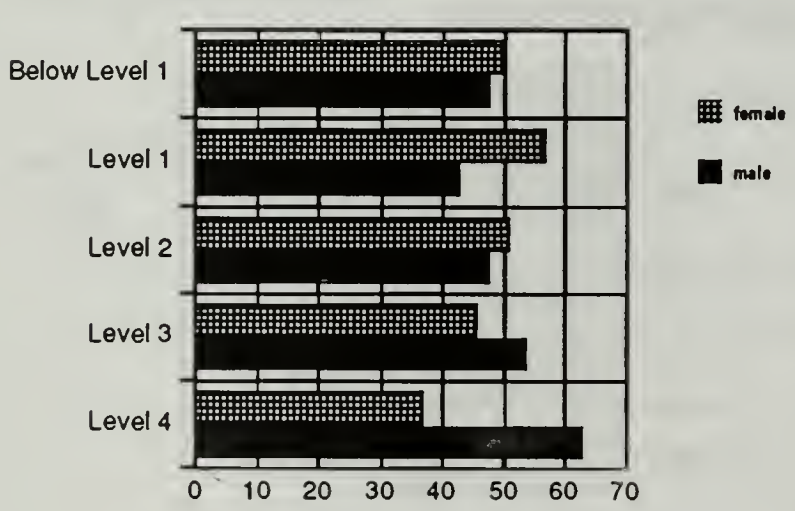
Differences Between Eighth Grade Boys and Girls in Proficiency Levels

Gender Differences, Grade 12

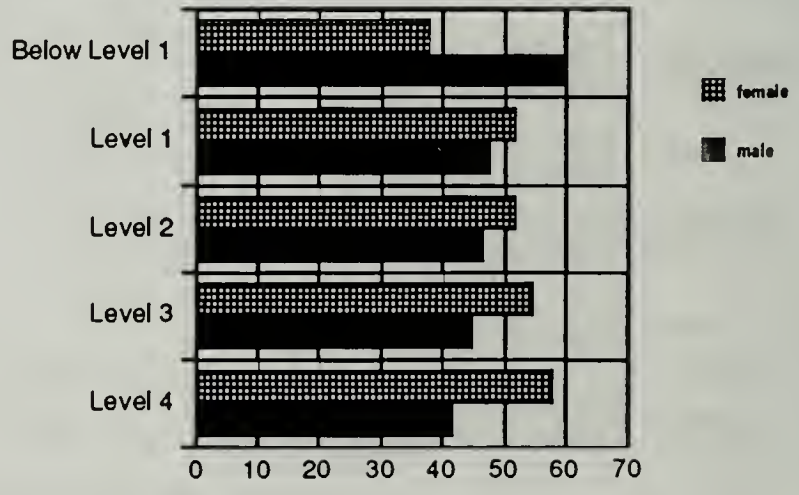
The differences in attainment between boys and girls increases by twelfth grade. Twenty-two percent more boys than girls are reading below Level 1. At the other extreme, the relatively small difference between the number of boys and girls at Level 4 in Mathematics increases to a 20% difference, while there is a 38% difference at Level 4 in Social Studies and a 26% difference in Science.

Questionnaire results give some insight into these gender differences in achievement. For example, 10% more twelfth grade boys are taking science, and in the area of Physics, the number jumps to 38% boys versus 22% girls. Boys also report that they are more interested in each of the three subjects in which they tend to excel. Conversely, more girls report that they find these subjects difficult.

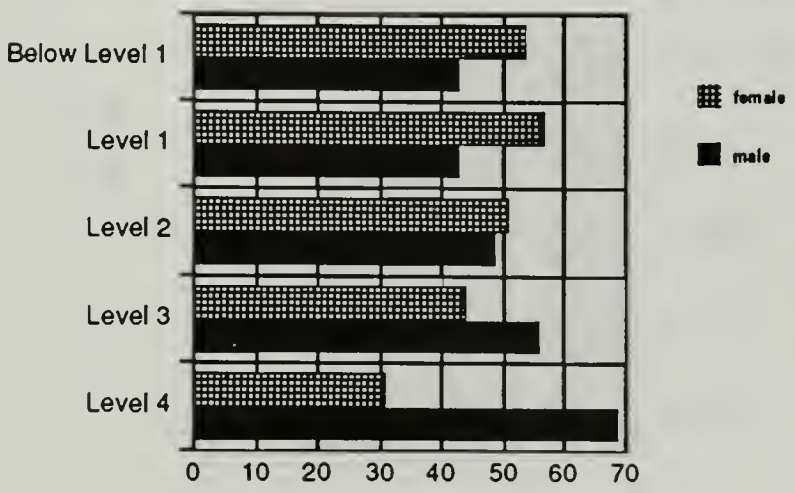
Twelfth Grade Science



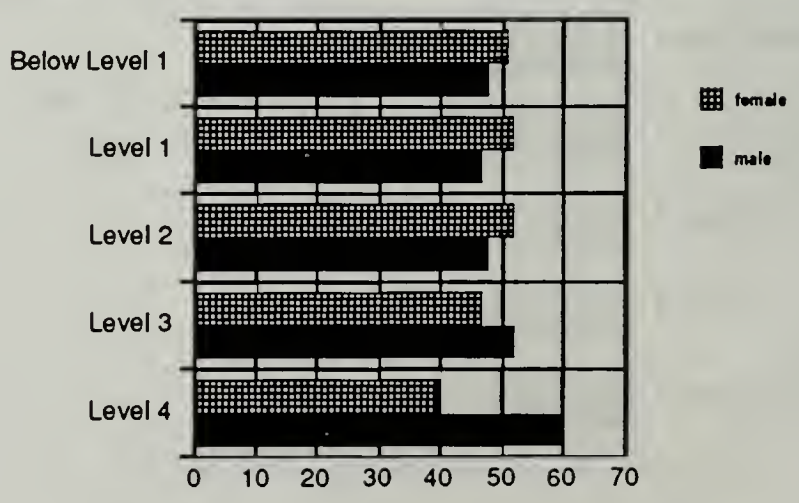
Twelfth Grade Reading



Twelfth Grade Social Studies



Twelfth Grade Mathematics



Differences Between Twelfth Grade Boys and Girls in Proficiency Levels

Summary and Conclusions

Most of the results in this chapter confirm our own findings in past assessments, as well as other studies. Socio-economic factors, such as parental education and educational resources in the home, are related to student achievement, as is personal use of time. When home and school life support each other, students tend to attain greater achievement. However, at the twelfth grade level in particular, the most dramatic relationship between student factors and achievement is not parental education or language, but the actual course followed by the students. This finding supports the claim that course-taking acts as a major "gatekeeper" to further education, as well as attainment, particularly among under-represented groups of students.

Another significant finding is the relative difference between boys and girls in achievement and intellectual involvement in various academic subjects. Although mathematics and science have been recognized as areas for concern, there has been much less discussion of the gender differences in social studies. This finding is particularly puzzling, in light of girls' high reading proficiency.

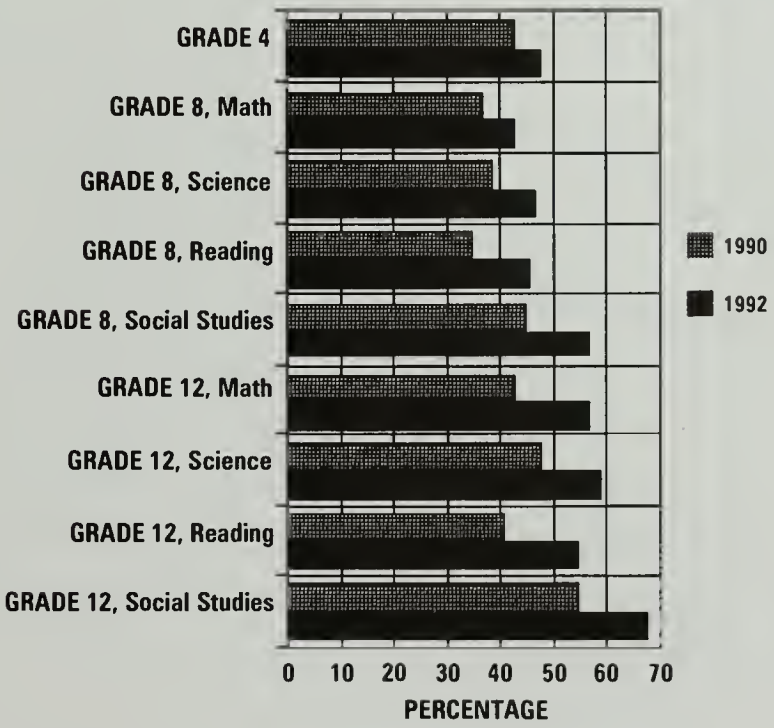
CHAPTER 4 *Massachusetts Schools*

Introduction

All fourth grade teachers and all reading/English, mathematics, social studies and science teachers of students at grades eight and twelve, as well as their principals, completed questionnaires. The purpose of these questionnaires was to investigate the context for the education of students in Massachusetts, as well as to yield information for informed policy decisions about instruction and resources.

The Teaching Force

Perhaps the most distinguishing characteristic of the teaching force in Massachusetts is its experience. In most subject areas and grade levels, nearly a majority of teachers have been teaching more than 20 years. Furthermore, the percentage is rising, with little entry into the teaching force over the past two years. On average, only 5% of teachers have had less than 5 years teaching experience. An entire generation of teachers is largely missing in Massachusetts. This suggests that, within the next few years, there will be a large and uniformly inexperienced group of teachers in the schools, with relatively few teachers of experience to act as "mentors" within school systems.



A comparison of the percentage of teachers with over 20 years experience: 1990 and 1992

On the other hand, only approximately 10% of principals at all levels have had as many as 20 years experience.

Although the majority of elementary school teachers and reading teachers are women, men predominate in science and social studies. The relative achievement of boys and girls that was discussed in Chapter 2 corresponds to this gender pattern among their teachers. Men also tend to be principals throughout the grades, even in the primary schools where the majority of the teaching force is female.

Gender of Teachers

	Male	Female
GRADE 4	19%	81%
GRADE 8, Math	44%	56%
GRADE 8, Science	59%	40%
GRADE 8, Reading	26%	74%
GRADE 8, Social Studies	63%	37%
GRADE 12, Math	56%	44%
GRADE 12, Science	68%	32%
GRADE 12, Reading	41%	59%
GRADE 12, Social Studies	74%	26%

Education

Massachusetts teachers tend to be well-educated. Approximately one-quarter of twelfth grade teachers hold a professional diploma based on at least one year's work beyond their master's degree. On the other hand, a quarter of the elementary school teachers have taken no mathematics or science courses since high school and, during the past year, a third have had no in-service or staff development beyond that required by district agreement.

Teachers' Perceptions of Problems

When asked to account for possible unsatisfactory progress among students, student indifference or lack of motivation was cited as very important reasons by approximately 60% of both eighth and twelfth grade teachers. This was followed in frequency by poor preparation prior to entering class and student absenteeism.

Class size was also cited as an important reason by over 20% of eighth grade teachers and 14% of twelfth grade teachers. It has increased in importance since 1990. Whereas in 1990, 64% of eighth grade reading teachers thought that class size was not an important reason for poor performance, in 1992, only 42% agree with that statement. More specifically, 21% of all twelfth grade teachers state that they have more than 25 students in their classes.

Resources

Lack of science equipment is increasingly perceived as a problem for both eighth and twelfth grade science teachers.

- **52% of eighth grade science teachers state that their students never perform individual experiments.**
- **16% of eighth grade science teachers state that they have little or no science equipment for their students to use.**
- **37% of science teachers state that their science equipment is in good condition, compared with 44% in 1990.**

Among eighth grade reading teachers:

- **9% state that they have few or no textbooks.**
- **18% state that they have few or no reference materials.**

Asked to characterize the extent to which social studies teachers have resources, the following stated that they had few or no materials:

	Grade 8	Grade 12
Primary source material	19%	14%
Supplementary textbooks	31%	24%
Reference material	20%	16%
Current sources (newspapers, magazines)	33%	27%

Finally, when eighth grade principals were asked about their annual budgets,

- **50% reported that less than $500 was allocated for science equipment**
- **37% reported that less than $500 was allocated for consumable science supplies**
- **36% reported that less than 100 library books were purchased**

Instruction

There is a slight but consistent pattern of involving students more in the process of learning. Among fourth grade teachers, who were asked the same questions in 1990 and 1992, the following responses were given:

My Students	1990	1992
keep a journal	53%	61%
work in groups regularly	55%	60%
share papers regularly	40%	47%

At the eighth grade level, more students are studying algebra (25% in 1992 versus 19% in 1990). Reflecting the increased introduction of algebra and pre-algebra in the eighth grade across the state, 61% of teachers (compared with 51% in 1990) report that they work with developing an understanding of variables at least twice a week.

Approximately 5% fewer teachers report that their students rely heavily on science textbooks or that they teach almost exclusively by lecturing.

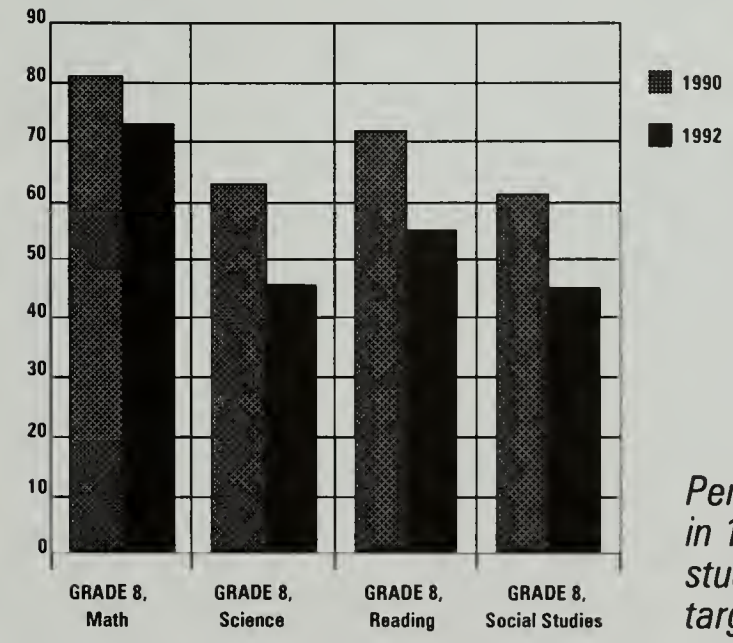
Among reading and social studies teachers, there is a slight tendency to report more writing, more work in small groups, more time in class spent studying literature, more classroom discussion and project work.

At the twelfth grade level, the most impressive change has been in the increased use of calculators in mathematics classes. Although mathematics educators have been advocating the use of calculators for many years, teachers have shown a reluctance to use them. However, their proposed inclusion in the SAT examinations may have precipitated their acceptance into the classroom. At present, 45% of twelfth grade mathematics teachers state that their students use school-owned calculators; while 19% state that their students use graphing calculators. The percentage of mathematics teachers who do not allow calculators in the classroom has fallen from 21% to 15%.

On the other hand, computers are less readily used. Twenty-one percent of teachers reply that they are not available, while 54% state that they are seldom or never used, although they are available.

Tracking

At the eighth grade level, there is a marked tendency among schools to replace tracking with classes of mixed ability. Perhaps because of the greater differentiation in course offerings, this is not as apparent at the twelfth grade level.



Percentage of eighth grade teachers in 1990 and 1992 who report that students were assigned to their target class according to their ability

Summary and Conclusions

In 1992, more than 55% of twelfth grade teachers and almost 50% of fourth and eighth grade have had more than 20 years experience. Among twelfth grade social studies teachers, this figure rises to 68%. This large proportion of the teaching force which is nearing retirement should be of major concern to policymakers and administrators throughout the state. An imbalance of gender among fourth grade teachers, twelfth grade science teachers, and social studies teachers of both eighth and twelfth grades is also a focus for concern, particularly in light of girls' poor performance in science and social studies.

Teachers report relatively less resources in 1992 as compared with the previous assessment, and class size is seen as more of a problem. On the other hand, there is evidence that curriculum reform has affected instructional practices. More teachers are employing active learning techniques in their classrooms and approximately 15% fewer school systems are tracking their students by ability. Finally, calculator use has increased in mathematics classes, particularly at the twelfth grade level.

CHAPTER 5 *Differences Among Schools*

Introduction

Although this report focuses on student achievement, it also examines the relationship of personal and instructional variables with achievement in order to inform policy. An underlying assumption is that, when certain practices are found to be highly related to performance, they should be supported and encouraged in order that all students may benefit.

On the other hand, there are certain social and economic factors that are beyond the control of schools. By reinforcing or counteracting the goals of schooling, these "unalterable" factors exert a powerful influence on the quality, as well as the effectiveness, of the educational process. In a sense, they "set the scene" for the academic dialogue which takes place in school and may determine the final outcome. In so far as we expect similar high standards of all students, we cannot ignore the differences that exist as a result of these factors. When these differences adversely affect the kind of education that students receive, they demand to be considered.

Consequently, this chapter will examine the nature and extent of these differences, focusing on the following questions:

Given a set of "unalterable factors" such as poverty, language, and educational advantage, what is the extent of the difference between schools?

To what extent do students in these schools differ in terms of their personal resources, habits and attitudes?

To what extent do these schools differ in their ability to establish a context for learning?

To what extent do these schools differ in their ability to provide resources that support learning?

Unalterable Factors: Distinguishing Schools

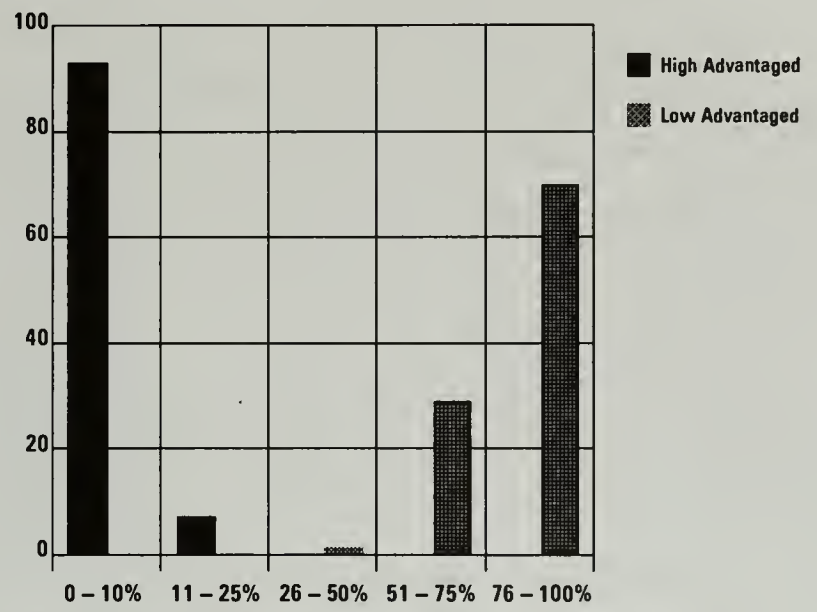
In attempting to examine the strength of the "unalterable" factors which are associated with educational advantage, scales were created using a set of variables measuring poverty, primary home language, and educational preparation. At the fourth grade level, educational preparation was defined by students' attendance at preschool. At the eighth and twelfth grades, students were asked to indicate the educational level of their parents or guardians.

The average value of each variable was computed and combined for each school. At each grade level, schools were ranked, and the highest and lowest 15% were classified as High Advantaged (HA) and Low Advantaged (LA) schools, respectively. All Low Advantaged schools at grades four and eight, and all but two at grade 12 are in urban settings. Almost all High Advantaged schools at grades 4 and 8 are in the suburbs of the larger cities (primarily Boston). At grade 12, there is a wider mix, including a number of regional schools.

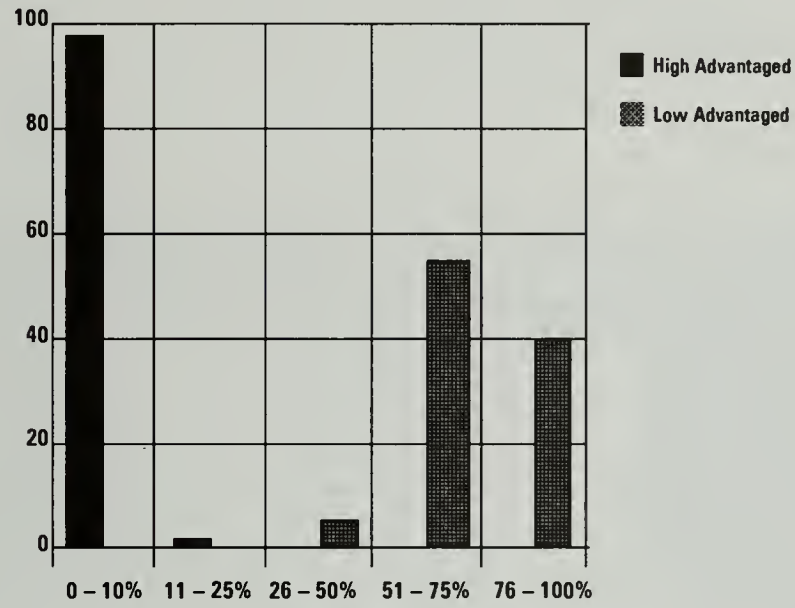
Given a set of "unalterable factors" such as poverty, language, and educational advantage, what is the extent of the difference between schools?

Extent of Poverty

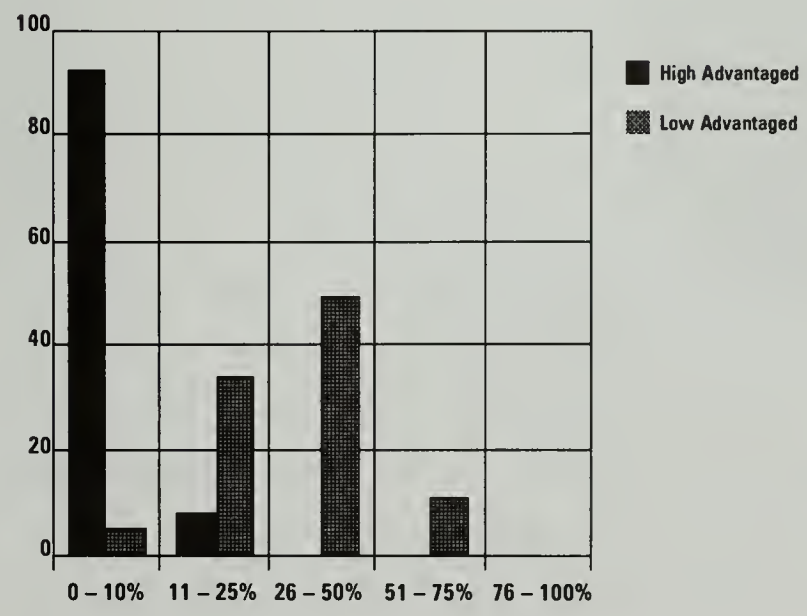
Although these schools were chosen because of the differences that they exhibited in terms of poverty, the ranking itself does not indicate the extent of the differential in need that was found in the two groups. Only at the twelfth grade level do the two types of schools overlap in terms of the percentages of students receiving food assistance. Furthermore, even the statistics on the next page do not indicate the extent of poverty in some schools. For example, in 23 out of the 138 Low Advantaged primary schools, 90% or more students were reported to be receiving free/reduced lunch.



Fourth Grade: Percentage of Students Receiving Free/Reduced Lunch



Eighth Grade: Percentage of Students Receiving Free/Reduced Lunch



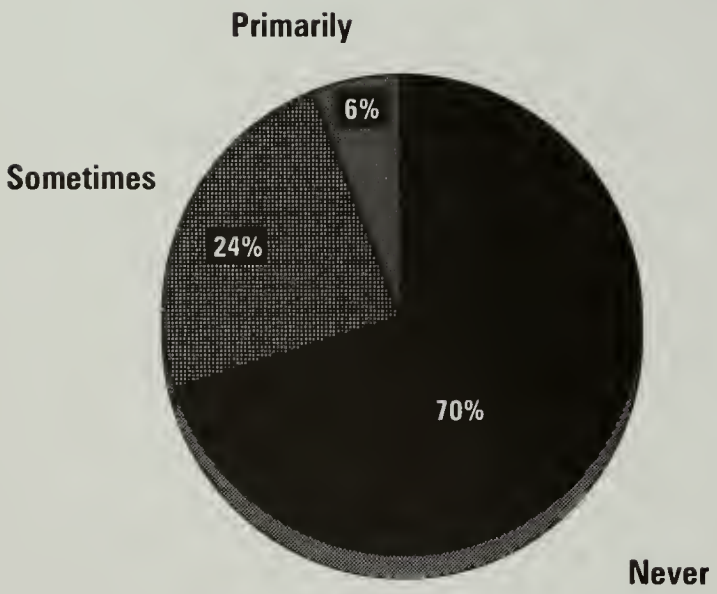
Twelfth Grade: Percentage of Students Receiving Free/Reduced Lunch

Language

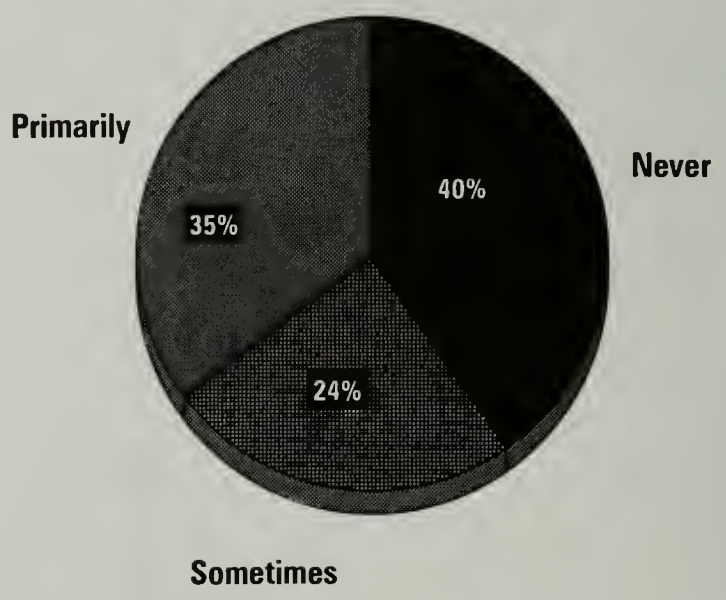
Students also differ in the extent to which they are familiar with the language of instruction. Although students who had been in a transitional bilingual program for 3 years or less were excused from the assessment, there remain large differences in students' background in English. For over a third of the students in Low Advantaged schools, the language of instruction is a "formal" language, substantially different from that spoken at home. In fact, almost a quarter of fourth graders in Low Advantaged schools stated that they had come to the United States from another country, compared to 5% in High Advantaged schools.

Again, the graphs do not illustrate the large concentration of non-English speaking students in some schools. In three of the Low Advantaged primary schools, 60% or more of the students come from homes in which English is rarely spoken. This is also the case in 7 of the 55 Low Advantaged eighth grade schools and in two of the 38 Low Advantaged high schools.

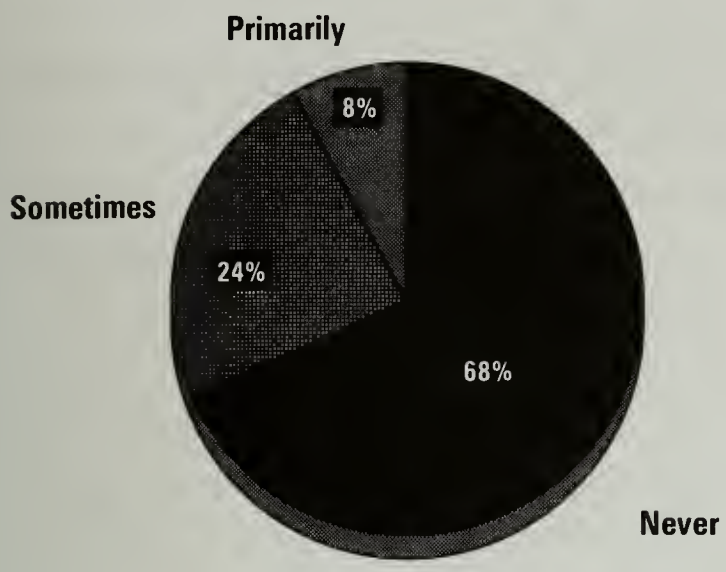
How often do the people in your home speak a language other than English?



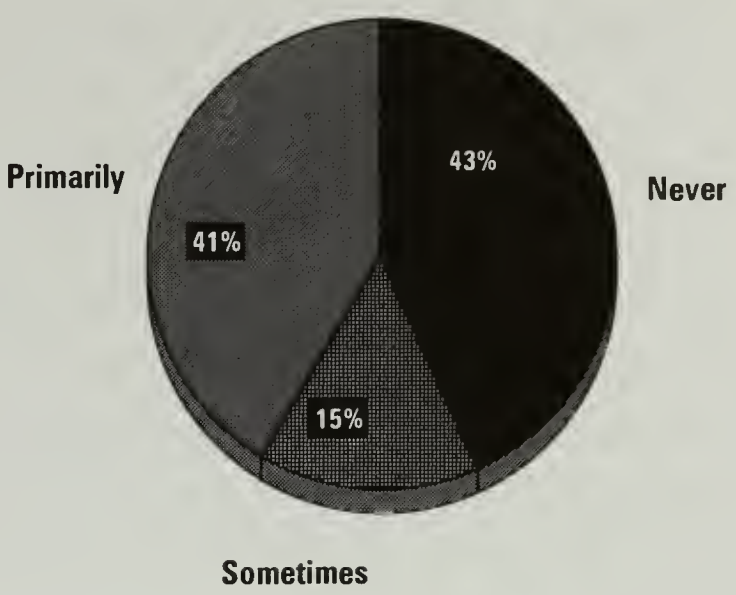
Fourth Grade, High Advantaged



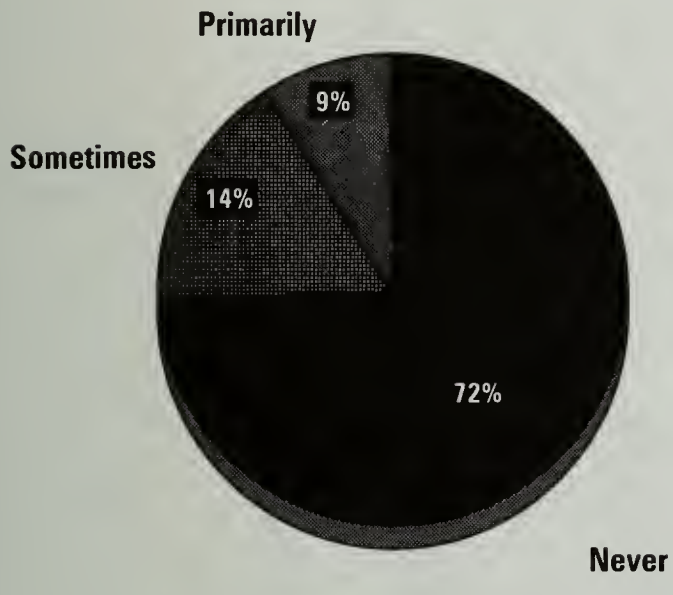
Fourth Grade, Low Advantaged



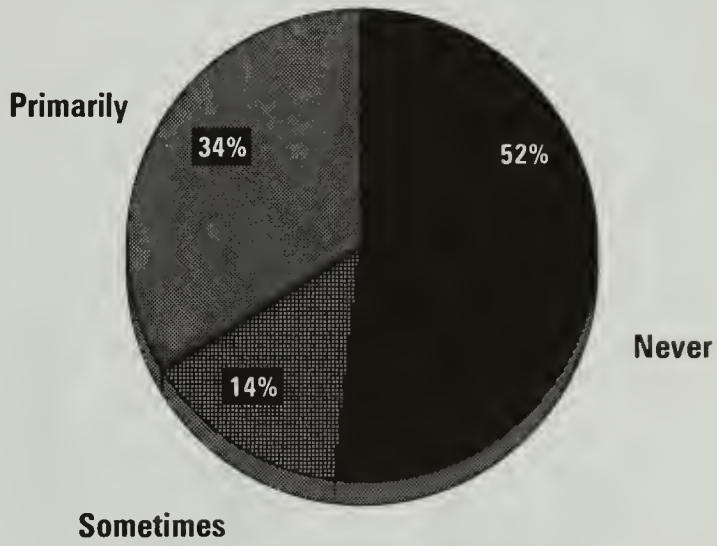
Eighth Grade, High Advantaged



Eighth Grade, Low Advantaged



Twelfth Grade, High Advantaged



Twelfth Grade, Low Advantaged

Educational Preparation: Pre-school

Early childhood education is being increasingly recognized as an important factor in later school success. Despite the prevalence of programs such as Head Start, many poorer students do not receive the preparation that pre-schooling affords.

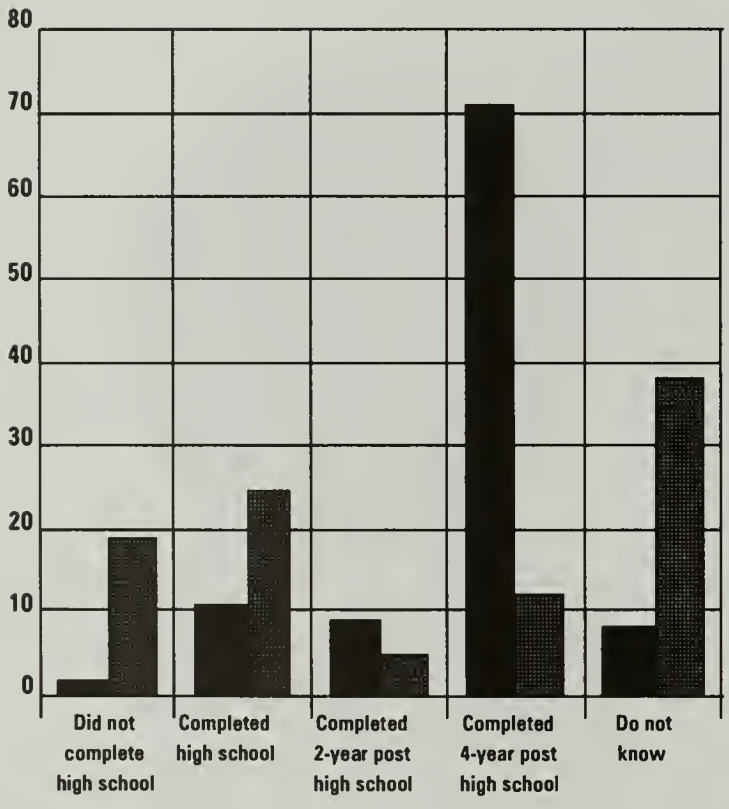
The vast majority (91%) of fourth grade students attending High Advantaged schools reported that they had attended some type of preschool or nursery, in contrast to less than half (44%) of students in the Low Advantaged schools.

Educational Preparation: Parental Education

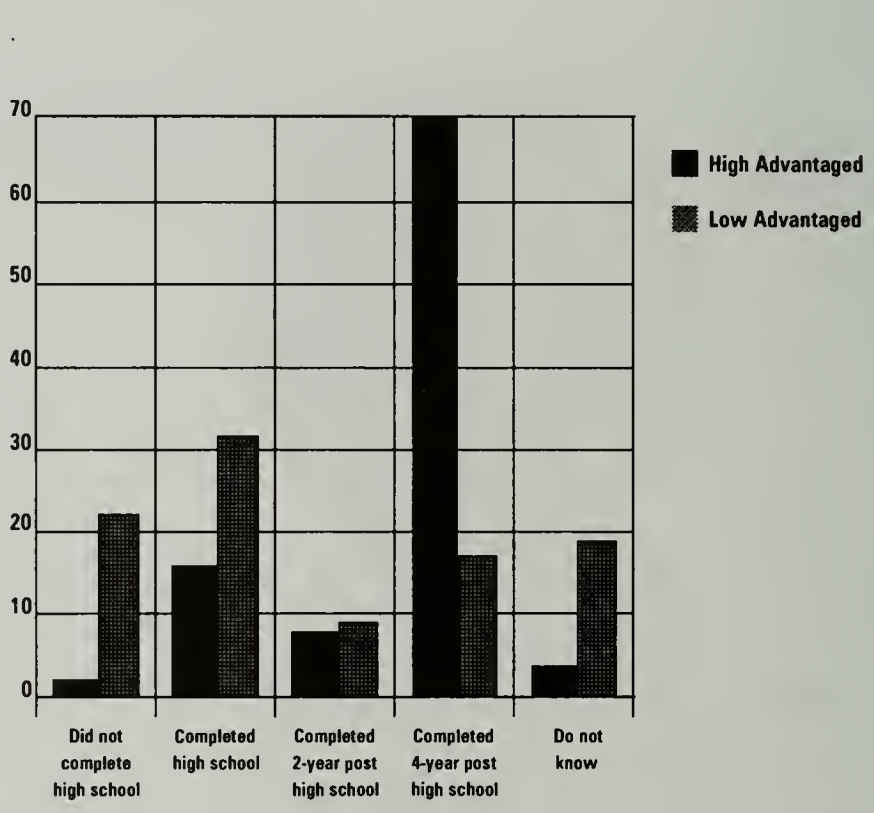
As discussed in Chapter 3, there is a large differential in achievement between students whose parents had not completed high school and those whose parents had satisfactorily completed some schooling. Parents who have successfully participated in schooling themselves implicitly or explicitly prepare their children for the educational experience. The graphs below indicate the extent of the difference in this type of educational preparation among students.

Note *Students who replied "I do not know" (***Do not know** *in the two charts below) performed at the same achievement level as students who answered "My father did not complete high school."*

Extent of Father's Education Among Students in High and Low Advantaged Schools



Eighth Grade



Twelfth Grade

To what extent do students in these schools differ in terms of their personal resources, habits and attitudes?

Personal Resources

Support from the home is not limited to the more intangible benefits afforded by parents' educational level, but comes from materials that reinforce the skills that schools teach. As discussed in Chapter 3, the extent to which books and computers are available to students in the home is highly correlated with achievement. At every grade level, students in High Advantaged schools were more likely to have such resources.

Availability of resources

	Grade 4		Grade 8		Grade 12	
	HA	LA	HA	LA	HA	LA
More than 30 books available	81%	46%	70%	36%	52%	32%
Computer available	65%	34%	74%	28%	72%	28%
Newspaper available regularly	—	—	—	—	89%	62%

Note *"HA" stands for "High Advantaged," while "LA" stands for "Low Advantaged."*

Habits

Fourth and eighth grade students in Low Advantaged schools tend to watch more television than their peers in High Advantaged schools. For example, approximately half of the fourth and eighth graders in LA schools report watching television 4 or more hours a day, in contrast to 17% of fourth graders and 8% of eighth graders in HA schools. While television watching is less prevalent at the high school level, approximately 20% of students in Low Advantaged schools continue to watch for 4 hours or more daily.

On the other hand, there is much less difference in the percentages of students who report that they read for fun on a daily basis, or in the number of books that students

read for their own interest. Forty-five percent report that they read every day on their own and 59% discuss school at home. Although the percentages are somewhat lower than those reported by students in the High Advantaged schools, the differences are much smaller than in the case of variables that reflect resources.

Attitudes

Almost half of the students from Low Advantaged schools believe that memorization is an important requirement for success. When presented with the statement, "Learning [mathematics, science, social studies] involves mostly memorizing," the following percentage of students strongly agreed.

SUBJECT	HA	LA
Social Studies	17%	45%
Science	17%	33%
Mathematics	10%	31%

At the twelfth grade level, the major difference between students in the two types of schools concerns their course work. By grade 12, 87% of students in High Advantaged schools are in an academic track, versus 56% of students in Low Advantaged schools. However, aspirations are not dissimilar. The majority of students in both types of schools hope to continue their education. Among students in High Advantaged schools, 84% expect to go on to a four-year college versus 49% of students in Low Advantaged schools. On the other hand, another 26% from LA schools expect to go to a two-year college or other type of school.

To what extent do these schools differ in their ability to establish a context for learning?

School climate is a general term for the extent to which the tenor of the school reflects its basic objective: the serious pursuit of education. A paramount component of this pursuit is continuity of instruction, as well as a commitment to the process. Among the two sets of schools there were significant differences in the extent to which this was the case.

Student Transiency

A basic stability is necessary for learning to take place. Aside from practical considerations, such as course and instructional variations, there are social and logistic adjustments that have to be made by students who change schools during the instructional year. Teachers also have to cope with the absorption of students who may be unfamiliar with course material or the culture of the individual classroom. In order to explore the extent that such changes interfere with instruction, principals were asked to estimate the percentage of their students who remained in the schools during the entire school year. As the table below indicates, in Low Advantaged schools student mobility was extremely high at both eighth and twelfth grade levels.

Percentage of students who change schools during the school year

	Grade 4		Grade 8		Grade 12	
	HA	LA	HA	LA	HA	LA
0–9%	92%	21%	93%	33%	97%	27%
10–29%	5%	52%	4%	44%	3%	57%
30–100%	2%	24%	2%	22%	0%	12%

Holding Power of Schools

It is assumed that, for schools to attain their objective, students must be in attendance on a regular basis and be prepared to participate in the learning process. As students grow more independent, tardiness and absenteeism become increasingly prevalent among all students. However, principals of the two groups of schools differed substantially in their judgments of the severity of the problem.

The extent to which tardiness is considered a problem by principals

	Serious or moderate		Not a problem	
	HA	LA	HA	LA
Fourth grade	5%	32%	64%	21%
Eighth grade	15%	60%	33%	4%
Twelfth grade	34%	87%	3%	3%

The extent to which absenteeism is considered a problem by principals

	Serious or moderate		Not a problem	
	HA	LA	HA	LA
Fourth grade	4%	34%	74%	14%
Eighth grade	7%	50%	63%	11%
Twelfth grade	6%	81%	36%	3%

Disruptive Factors

Schools differ in the extent to which educational pursuits are the prime concern of students. Although the ideal school community is one that engages students and their teachers in the common pursuit of knowledge and personal fulfillment, in actuality school walls are permeable. Students' behavior in the classroom often reflects their personal problems and the attitudes that they hold toward the larger world. As a result, schools differ in the extent to which they can offer students the security necessary for a

successful academic pursuit. This condition is clearly reflected in the evidence obtained from the questionnaires, which asked principals to list the extent to which different types of anti-social behavior presented a problem within their schools.

Elementary School Principals' judgments of the extent to which the following are problems

	Serious or moderate		Not a problem	
	HA	LA	HA	LA
Physical conflicts among students	9%	32%	56%	19%
Theft	0%	12%	86%	51%
Vandalism	1%	20%	70%	36%
Weapons	0%	10%	96%	70%
Verbal abuse of teachers	0%	15%	84%	42%

Eighth Grade Principals' judgments of the extent to which the following are problems

	Serious or moderate		Not a problem	
	HA	LA	HA	LA
Physical conflicts among students	4%	55%	35%	2%
Theft	2%	19%	57%	17%
Vandalism	2%	29%	61%	7%
Weapons	0%	24%	85%	22%
Verbal abuse of teachers	0%	42%	74%	7%

High School Principals' judgments of the extent to which the following are problems

	Serious or moderate		Not a problem	
	HA	LA	HA	LA
Physical conflicts among students	3%	36%	64%	9%
Theft	8%	18%	31%	18%
Vandalism	6%	42%	36%	18%
Weapons	0%	30%	89%	39%
Verbal abuse of teachers	3%	33%	64%	15%

At twelfth grade several other factors arise. One is the use of alcohol and drugs. Alcohol is reported as a serious or moderately serious problem among 52% of principals of High Advantaged high schools, compared with 27% of Low Advantaged schools. Despite publicity, drugs is seen as less of a problem overall (approximately 20% of both types of schools).

To what extent do these schools differ in their ability to provide resources that support learning?

Except for the strong emphasis placed upon reading in Low Advantaged schools and the relatively more exploratory approach of High Advantaged schools, both student and teacher descriptions of instructional approaches at the fourth and eighth grade levels differ little in the two sets of schools. Those aspects that do differ dramatically are related to the resources that are available. For example, twice as many fourth grade teachers in High Advantaged schools as in Low Advantaged schools replied that they received most or all the resources that they needed (63% vs. 29%). When twelfth grade teachers were asked a similar question, the following results were obtained.

Twelfth grade teachers who state that they receive all the resources they need

SUBJECT	HA	LA
Reading	41%	11%
Social Studies	35%	12%
Science	24%	11%
Mathematics	40%	25%

As a result of this general lack of resources, a significant percentage of students in Low Advantaged schools are deprived of educational experiences that rely upon the use of equipment. For example, when fourth grade teachers were asked if they had the following materials which are considered important resources in promoting instruction, those who answered in the affirmative were primarily from High Advantaged schools.

Fourth grade teachers who state that they receive important resources in promoting instruction

	HA	LA
Calculators	80%	38%
Computers	87%	45%
Primary source material	82%	57%
Math manipulatives	86%	57%

Similarly, when eighth and twelfth grade students were asked if they ever experienced using the following instruction aides, the percentage of students who reply that they never were given the opportunity were as follows.

I NEVER:	Grade 8 HA	Grade 8 LA	Grade 12 HA	Grade 12 LA
Use a calculator	11%	60%	10%	28%
Watch films/videos	12%	42%	9%	18%
Perform experiments	6%	46%	5%	25%

Principals' reports support this differential in resources between the two sets of schools. When asked the amount spent on science equipment, science supplies and the number of books purchased for the school library during the past year, responses differed substantially.

Amount spent on science equipment, science supplies, and books during the last year

	Grade 4 HA	Grade 4 LA	Grade 8 HA	Grade 8 LA	Grade 12 HA	Grade 12 LA
Less than $250 spent on science equipment	34%	67%	15%	35%	8%	33%
Less than $250 spent on science supplies	24%	70%	0%	54%	0%	21%
Less than 100 books bought	22%	54%	22%	48%	17%	45%

This lack of resources, particularly in science, cannot be unrelated to course offerings. Twelfth grade students at High Advantaged schools are three times as likely to have a double lab period in science and twice as likely to have double periods in physics and biology. More varied courses are offered at High Advantaged schools and they tend to be at a higher level (i.e. Advanced Placement). In High Advantaged high schools, courses more likely to be taught are economics, sociology, psychology, world history and English history. In Low Advantaged schools, geography and government are more likely to be offered.

Summary and Conclusion

The "unalterable factors" of poverty, language, and educational orientation do not exist in a vacuum. They encourage the presence of other conditions and behaviors and, in turn, feed off them. Lack of continuity in schooling is particularly prevalent among students whose life is affected by economic forces. Personal and/or financial pressures conflict with the pursuit of education. A home environment that lacks the resources to provide reinforcement to school activities is a major handicap. These are some of the challenges that impede students in their pursuit of education. Such students are in need of special help. Yet, it appears that the demands that these students place upon schools and the resources which their schools possess to meet those demands are ill-matched. It is a matter of particular concern that the differential between needs and resources is evident from the outset of the schooling experience. It may account for the large differences in achievement that become institutionalized in the later grades.

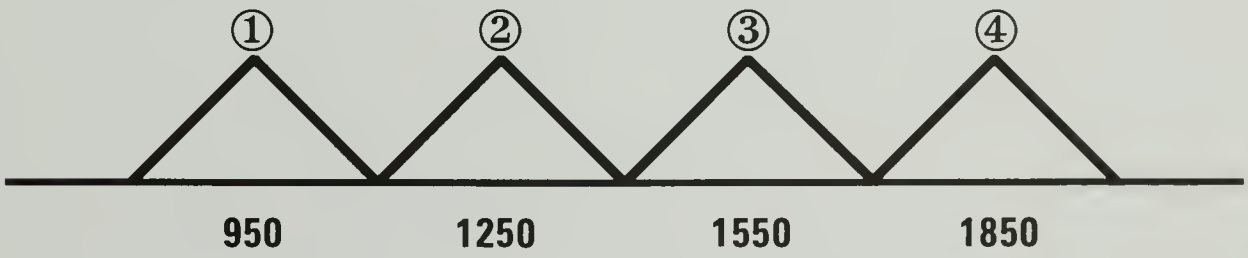
APPENDIX *Description of the Proficiency Levels*

Introduction

The proficiency levels that are described on the following pages reflect the judgment of educators throughout the state. Our five curriculum advisory committees, composed of teachers and curriculum coordinators from a representative sample of schools, met during 1991 to develop a set of open-ended questions that would reflect the assessment frameworks. These questions, as well as the larger set of multiple-choice questions, were administered to all students at grade levels four, eight, and twelve as part of the Massachusetts Educational Assessment Program. A matrix-sampling design was used, with each student completing only part of the much larger pool of questions. Responses to the open-ended questions were rated by the contractor and by approximately 700 Massachusetts teachers. Next, a larger group of teachers and curriculum coordinators met to review the open-ended questions and characterize each of the ratings in terms of the level of proficiency that it represented. These levels were then statistically related to a corresponding interval on the multiple-choice scale. (See diagram below.)

Procedure for Determining Proficiency Levels

- Multiple choice were scored and scaled 950–1850
- Open-ended were judged for proficiency levels 1–4
- Proficiency levels 1-4 were mapped to multiple choice scale



Although the examples consist of open-ended responses, the proficiency level descriptions that are included in this report are based on the results of both the multiple-choice and the open-ended questions. Each type of question has contributed different, but complementary, information to the descriptions of performance. For

example, multiple-choice questions, which require students to select the correct or most appropriate option from a set of possibilities, call upon students' ability to recognize information, to read critically, to make inferences, and to analyze written material. Open-ended questions, in which students must determine the requirements of the task and generate their own response, require more active use of knowledge. Students must recall relevant prior knowledge, evaluate it, make generalizations when appropriate, and structure their arguments. Taken together, the information provided by these two types of tests provides a much richer description of student's capabilities than could be gathered from one or the other.

The responses of students whose performance falls below Proficiency Level 1 are not described in this report because these students were unable or unwilling to answer the open-ended questions. However, this does not imply that they are incapable of answering any questions. Typically, these students can identify the correct option of 2-5 multiple-choice questions which require recognition of common factual knowledge; however, they appear to lack the cognitive or language capabilities to respond in a less structured context.

The descriptions that follow are based on a consensus about the kinds of thinking that students should be able to engage in. By providing these descriptions and examples we hope to set the context for a discussion that does not limit itself to what students cannot do, but reaches beyond this to an examination of our expectations for all students and the standards to which we hold educators accountable.

GRADE 4 *Reading*

In this poem Claudia Lewis tells about something that happened long ago in a classroom. Read to see what the speaker saw.

Not In A Hundred Years

In fourth grade
one boy,
Milton,
couldn't read.

Gawky,
tall, and thin,
when it was his turn
he would stand,
fumble with a word or two,
then sit down again.

Hopeless!

But one day
a few words came.
then a few more.
Our teacher stood,
moved near,
"Yes, yes, that's right!
You can read it,
Milton!"

He went on, stumbling,
but words came.
"Of course! Of course!
Keep going, Milton!
I knew you could –"

And now the next word,
starts with 'm' just like your
name –
"Yes – yes –
Go on!
Good!"

Every one of us
sat listening,
watching,
as Miss Baldwin
pushed words
out of Milton,
prompting,
urging.

She waved her arms,
her voice rose
and rose.
And I suddenly sat
glued to my desk,
amazed, seeing what I never
dreamed
to see, in a hundred years,
great tears
in my teacher's eyes.

Claudia Lewis

Suppose Miss Baldwin is your teacher. A new student in school asks you, "What is Miss Baldwin like?" Write what you would tell the new student about Miss Baldwin. Use what happened in the poem to help you describe her.

Below Level 1

9%

Level 1

32%

Students at this level are beginning to master the basic facts and procedures of the elementary school curriculum.

"In this poem Claudia Lewis tells about something that happened long ago in a classroom. The speaker saw tears in her teachers eyes."

In answering open-ended questions, students at this level are able to identify the setting of a story and the major story events; and locate specific information contained within the text. However, they tend to identify details and repeat information from the passage rather than generate their own response.

Level 2

36%

Students at Level 2 are adept at using basic skills and concepts when presented

"Miss Baldwin is nice she says nice things about the kids. She likes the childrens poems alot. Miss Baldwin is nice to the kids. She's not always mean but mean a little. She says alot of words to the children. She's nice to the new kids that come into the class. She is Beautiful almost every day."

in familiar contexts. Their answers have minimal content, lacking elaboration and examples.

Students at this level are beginning to use reasoning skills but often their reasoning is flawed or incomplete. They are able to take a position, although they offer no explanations; or they may give generalized explanations, rather than using specific textual evidence.

Level 3

20%

Students at this proficiency level have mastered the taught curriculum. They are keen observers, think clearly and are beginning to recognize abstractions. They communicate adequately, with some minor misconceptions.

"She is nice, I would say to the new child. When you do something right she praises you. Sometimes even if you are not doing it right she urges you on anyways. When you do something right after ten or twenty tries, she gets very excited and happy. That is what I would say to the new student."

Students at this level are better able to deal with longer narrative passages of more complex style and subject matter than those at the lower levels. Their greater competence in reading allows them to remember details and to provide inferential evidence that is dependent upon a literal interpretation of the text.

These students are able to draw conclusions with relevant support from the story. They can recognize the main idea of the passage and go beyond the literal interpretation of the text. Specifically, they can infer character traits and provide supporting evidence. Although these students can answer the questions adequately, their responses are not elaborate.

Level 4

3%

Students at Level 4 combine strong critical thinking skills with significant prior knowledge to generate logical, well-supported answers. They communicate effectively and creatively, with clarity and appropriate detail.

"I would tell the new student that she is very encouraging because she says words like 'Yes, yes, that's right! You can read it, Milton!' whenever Milton fumbles when he is trying to read aloud in front of the whole class. Miss Baldwin really cared about Milton's education because she would not let him give up even when he kept on stumbling as he continued to read. She kept giving clues to help him with his reading. She would say 'and now the next word starts with "M" just like your name' and he would get it right. She never ever yelled at him for making mistakes, but kept on urging him to read by praising him and saying 'yes-yes' Go on! Good!' and little by little Milton kept on reading the words right. She was so happy when he read the words right that she cried. Miss Baldwin is caring, kind and encouraging. That's what I would tell a new student about Miss Baldwin."

These students appear to have achieved a level of skill that allows them to consider passages as a totality, rather than as a sequence of separate parts. They are able to recognize the author behind the text, showing an understanding of literary devices and voice. They also understand the author's intent and can link important ideas.

They generate full, well-developed arguments and explanations and justify their position with appropriate supporting evidence from the passage. They use information to hypothesize and generalize. Their inferences are creative as well as appropriate and clear, and their responses are elaborate and coherent.

GRADE 8 *Reading*

In the 19th century, factories to make cloth were built in Lowell, Lawrence and the surrounding areas. These factories, called textile mills, employed young women to run the weaving looms. These women also prepared the wool and cotton by stiffening it with a paste called "size."

At first, their living and working conditions were reasonable, but soon the women were badly used. As a result, they began to organize themselves in order to improve their lives. Some of them attempted to use the power of the press to call attention to their situation.

Below is part of a letter that a factory girl wrote to the editor of the Daily Evening Voice. Read it and answer the question that follows.

Letter from a Factory Girl

To the Editor of the Daily Evening Post:
Lowell, July 2, 1866

A victory on the side of Labor has occurred here, which I fear has not come under the notice of "Observer."

I will try and give you the account, hoping you will publish it for the encouragement of others who labor under the supervision of soulless men. It happened in the "dressing room"* of the Merrimack Corporation.

All who are acquainted with the mills know that the dressing room is at best an uncomfortable place to work. In the room mentioned there are fans communicating with the air outside, and when running they add much to the comfort of the dressers. But it required a little more water to run the fans, so the agent determined they should be stopped. Not satisfied with this, he also ordered that the girls should put up their own size.* This would enable him to discharge from two to four men.

But the girls, determined not to submit, called a meeting and voted unanimously not to start their frames till the size was put up for them and the fans set in motion.

*(The "dressing room" is where yarn is treated with a starch paste called "size".)

Imagine yourself as the factory girl and complete the letter explaining how the crisis in the dressing room of the Merrimack Corporation was resolved. Please base your "ending" on evidence from the unfinished letter.

Below Level 1

13%

Level 1

30%

Students at this level have mastered most of the basic facts and procedures of the curriculum; however, their understanding is limited to the specific context in which the material is learned.

"And if not the factory girls will quit. So will you publish this for the over-worked factory girls."

These students experience difficulty when asked to structure their own responses to open-ended questions. Typically, they do not recognize the more analytic requirements of such tasks and respond with a literal approach, referring directly to factual details without reference to context.

Level 2

26%

Students at this level are familiar with much of the knowledge and skills that are typical of the curriculum, but find difficulty in applying that knowledge. Although generally correct, they tend to give minimal responses, lacking support or adequate explanation.

"Thanks to our determination we have their frames set up for us and the fans are now running so it is more comfortable but we are glad that we won this battle. Although we do not know why they gave up so soon we are just glad that we won."

Although student responses at this level tend to be reasonable and often valid, they lack definition and structure. For example, these students may be capable of identifying the general tone or theme of a passage, but they experience difficulty in analyzing prose or presenting a coherent argument. They perform better in dealing with the literal details in informational material than with the ambiguities of fictional pieces. When presented with poetry or fictional passages that depend upon satire or metaphors for effect, they show minimal understanding and do not go beyond the literal.

Level 3

24%

Students at this level are able to analyze and evaluate material presented in unfamiliar contexts and to apply their learning. They reason well and communicate adequately.

"When the agent found out about this he thought they were pulling his leg. But after a few days and he was facing alot of heat from the other factories he finally put the fans back on. I want this story to be published so all the other working women under the command of men will realize if you stop tolerating it they will give you the priveleges we deserve."

These students go beyond the literal facts presented in the passages to construct meaning from the text. Using the written material as a scaffold, they can apply reasoning and prior knowledge to draw inferences. Their responses could be characterized as reasonable and coherent. Their approach is orderly; however, it lacks the level of analysis or detail to make it convincing.

Level 4

7%

Students at this level are distinguished by their ability to analyze material and reason from it. Their responses show well-developed and creative arguments, with use of supportable evidence and terminology to clarify their ideas.

"The agent of course, brought this to the notice of the manager, who decided to discharge those concerned. However, to his considerable surprise he found there were too many to discharge at once, for it would be harmful both to the factory, which is short of workers, and, of course for his reputation. So, he decided to raise their wages somewhat if they would go with the agent's conditions. At that moment, however, a girl stepped forward, 'Sir, we have met here to secure our rights, not for my sordid purpose of gain. We want better working conditions, not money.' Then she turned and walked out of the room. One by one, the others followed. The next day the manger issued a proclaimation that the fans would be set in motion, and the size put up. Thus Labor triumphed. May it continue to do so everywhere!"

Students at this level display a sophisticated understanding of the craft of writing. They are familiar with stylistic devices, poetic forms, irony and metaphor, and the characteristics of different genre. Their vocabulary is extensive, displaying an ability to differentiate between nuances in the meaning of words. They effectively organize material and generalize from specific textual examples.

GRADE 12 *Reading*

In his novel *Hard Times*, Charles Dickens criticizes the educational system that developed in England during the Industrial Revolution. Read the opening chapters of the novel for an introduction to the industrialist Thomas Gradgrind and the educational system he has established for the children of his workers.

Explain why you think Charles Dickens chose the title "Murdering the Innocents" for Chapter Two.

Below Level 1

15%

Level 1

29%

Students at this level perform best in personal and practical contexts. They have acquired some academic skills that are useful in everyday life, but experience difficulty in recognizing the requirements of unfamiliar tasks.

"I think Charles Dickens chose the title Murdering the Innocents because of the name 'Sissy' that Sissy Jupe's father named her."

Students at this level experience difficulty when asked to construct their own responses. Although they can identify literal information within a passage, they cannot use that information to generalize or to make inferences. When asked to summarize a short passage, they had difficulty in recognizing and evaluating the major points. This difficulty in evaluation of text (as distinct from recognizing factual content) is apparent in their inability to recognize bias or author's point of view.

Level 2

27%

Students at this level are familiar with the major topics of the curriculum, but have limited understanding of the underlying concepts. Their responses are characterized by misconceptions or a lack of detailed information and analysis.

"Charles Dickens uses the term 'Murdering the Inocents' as the title to chapter two to describe the way Thomas Gradgrind treats the children of his class. Mr. Gadgrind asked Sissy to define a horse. In doing so, he gave her no time to react. When she didn't react to the question mr Gringrad yelled at her and refered to her as 'Girl number twenty.' She hadn't done anything wrong and she was scolded and reduced to number again."

When asked to create their own responses, these students can locate information which is stated explicitly in passages, list details, and summarize key ideas, often depending on key words or phrases which were provided for them in the prompt. However, although they can generally recognize the main ideas of a passage and make low level inferences, they operate primarily on a literal level. Their answers tend to be minimal, lacking organization and supporting detail.

Level 3

19%

Students at this level have mastered the secondary school curriculum. They can integrate and apply a broad base of academic knowledge and can communicate their reasoning competently.

"I feel that Charles Dickens chooses the title 'Murdering The Innocents' for chapter two because of his feelings on children. He doesn't show them any compasion or caring. He just gives them their lessons in a cold harsh way. he doesn't treat them like people. By treating the kids like this he is killing the innocent, child-like nature in them. If kids don't have fun they loose their childhood which is like murdering them."

Students at this level comprehend a wide variety of material, including passages that contain complex ideas and detailed technical descriptions. In addition, they can relate information abstracted from the text itself, from other reading, and from their own experience in their construction of meaning.

They recognize implied meanings and universal themes and can draw reasonable inferences regarding similarities and differences, cause and effect, etc. They are knowledgeable of genre, can recognize point of view, and can employ strategic reading. Their responses reflect their ability to analyze and evaluate.

Level 4

10%

Students at this level bring a broad and detailed base of knowledge and understanding to the solution of problems. They are able to organize information, analyze it, and generalize from it to solve problems and construct new meaning. They are creative, independent thinkers who reason and communicate with power.

"'Murdering the Innocents' is an appropriate title for Chapter 2 for Charles Dickens is illustrating the 'mental murder' endemic to the English educational system during the Industrial Revolution. Dickens portrays Thomas Gradgrind as a square man (there are numerous references to a square throughout the text). In essence, Gradgrind is sharp and harsh; he has no smooth edges and is equally brutal on all sides (as is a square a perfect equilateral). Also, Gradgrind's mere name suggests the animosity with which Dickens addresses the English educational system. 'Grad' refers to the students and 'grind' is their fate as if thrown to a meat grinder.

In short, Dickens was appalled at education in his times and thus was compelled to entitle his work Hard Times."

At this level, students are able to deal with the reading passages as a totality, reflecting on the author's purpose and the techniques used to achieve that purpose. In other words, they are able to distance themselves from the meaning of the text itself to take into account the actual craft of writing. For example, they can identify and use stylistic techniques; they understand figurative language, irony and satire.

These students apply higher level critical thinking skills to interpret and evaluate what they are reading. They synthesize and integrate information, recognize parallel situations, and take and represent different points of view effectively. Their written responses are marked by an elaboration of thought, in addition to a logical soundness. Furthermore, the creativity in their approach is evident in their unique (and thoughtful) responses.

GRADE 4 *Science*

The Voyager I and Voyager II spacecraft have been put into space to gather information about other planets where humans may be able to live. Write about important things that a planet must have for people to live on it. Discuss at least three things and explain why each is necessary.

Below Level 1

5%

Level 1

41%

Students at this level are beginning to master the basic facts and procedures of the elementary school curriculum.

"They should have a big bubble around it because then the people would be able to breathe.

They should have people go up there to make houses and cars like we do. I hope they make some of the things I listed. I think they are good reasons.

I think they could have a post office, a library, a railroad station, and definitely a school, and a movie house and houses, bridges and apartment.

And they can have states, towns, just like we do so it will be like us and them."

In answering open-ended questions, students display a grasp of general factual knowledge but do not recognize the requirements of specific tasks. They can make simple observations, but their answers often appear incomplete because of poor reasoning skills, lack of examples, an inability to interpret data, and a tendency to restate the facts.

Level 2

34%

Students at this level can apply basic skills and concepts when presented in familiar contexts. Their answers have minimal content, lacking elaboration and examples.

"Gravity – It's necessary for someone to stay on the ground.

Living Quarters – People have to have a place to live.

Crates of Food – They need food to survive."

In answering open-ended questions, students display fact-based knowledge strengthened by some comprehension and understanding. They are accurate observers but tend to describe rather than interpret data. They make direct associations with ease but falter at predicting long-range outcomes. When asked to construct an experiment, these students do not appear to recognize the need for controls and multiple trials.

Level 3

18%

Students at this level have mastered the taught curriculum. They observe keenly, think clearly and begin to recognize abstractions. They communicate adequately, with some minor errors.

"Gravity air and water are all needed.

This is because if we didn't have gravity on our planet we would be floating all over the sky, everything else like trees, grass and flowers also. Gravity pulls us and everything else to the core of the earth, this is why we stay put on the ground.

We need air to keep us from getting suffocated.

Water, every critter on earth needs water to live. If we didn't have water we would dehydrate and then die.

I am glad earth is a living planet."

Students at Level 3 are beginning to make connections between the abstract and the concrete and can successfully incorporate prior knowledge with new concepts. Although they can display data appropriately, their ability to generalize remains weak. For example, when given a set of data about the kinds of fruit fourth graders prefer, students arrive at very specific rather than general conclusions. Although their answers are adequate, showing some reasoning and accurate conclusions, these students remain within the confines of the question and do not elaborate a great deal.

Level 4

2%

Students at this level combine strong critical thinking skills with significant prior knowledge to generate logical, well-supported answers. They communicate clearly, effectively and creatively using appropriate detail.

"For people to live on a planet, the planet must have oxygen for people to breathe. If we cannot breathe for too long, our heart will stop pumping blood.

A planet which people live on must have sunlight. Sunlight helps the vegetables which we need to eat. Sunlight also helps our body produce vitamins.

Finally, a planet must have water for living things to survive. We must have water because it has vitamins in it. Plants need water to make food and we eat plants. Those are three elements that a planet must have for people to live on."

These students are able to link facts, concepts and observations to arrive at accurate conclusions. Additionally, they are able to represent data in many ways. Students use prior knowledge at all levels, but the most proficient students use appropriate knowledge to demonstrate an abstraction. Students at this level are able to transfer skills from one discipline to another. Their answers demonstrate depth of understanding as well as elaboration.

GRADE 8 *Science*

Wilma has heard that wolves and their relatives (dogs) howl more at night when the moon is full. Describe in detail an investigation you could do to decide if this is true.

Below Level 1

7%

Level 1

38%

Students at this level have mastered most of the basic facts and procedures of the curriculum; however, their understanding is limited to the specific context in which the material is learned.

"To decide if it is true whether wolves and dogs howl more at night you could take two dogs, of the same breed, sex and age, and put them in an artificial backyard set up for this experiment.

The backyard should have a doghouse, food, grass and anything else needed to form a natural habitat. Put the dog in the backyard and tape his howls. (One of the dogs should be tested at night and the other during the day.)

The same test may be conducted with the wolf, but the backyard may be replaced with the wolves natural habitat."

When presented with open-ended questions requiring experimental design, these students don't recognize which variables need to be controlled, nor can they develop valid scientific procedures. Although they appear to be familiar with popular scientific topics, such as the environment, they cannot relate their general knowledge to specific issues, and experience difficulty in interpreting the requirements of the tasks.

Level 2

24%

Students at this level possess much of the knowledge and skills typical of the curriculum, but have difficulty applying that knowledge. Although generally correct, their responses are minimal, lacking support or adequate explanation, or are marred by major misconceptions.

"First of all, I would turn the investigation into a five step process. Step 1 - round up a large group of dogs and wolves. About ten dogs and ten wolves. Step 2 - Get a calendar and mark down all of the days that you'll be able to see a full moon. Step 3 - Put each animal in an area that is familiar to them. Away from people and away from other dogs and wolves. Step 4 - record the number of dogs that howled and subtract that by ten. Do the same for the wolves. Step 5 - make an average for the dogs and make an average for the wolves. Then, put the two averages together and make one big average. Then you will come to your conclusion."

When presented with an experimental situation, these students are unable to create a workable design. Nor can they apply the scientific processes that they identify in multiple-choice questions. When given a set of data, they arrive at an immediate conclusion and use it to justify their responses, rather than organizing the data in order to reach a conclusion. Although they recognize some general principles, their analyses tend to be vague and their responses minimal, with little or no explanation, or are marred by major misconceptions.

Level 3

27%

Students at this level recognize the underlying concepts of the curriculum and can apply their learning to new contexts. They reason well and communicate adequately.

"To investigate if wolves and their relatives howl more at night when the moon is full, you could easily video tape the wolves. First, you set up a video camera where wolves howl at night. Do this on a night when the moon is full. Compare tapes. You should have your answer."

At this level students construct competent responses. They are knowledgeable about experimental procedure and can produce a satisfactory experimental design. They can organize raw data to reveal relationships but cannot draw inferences. Their generally adequate responses are characterized by a limited scientific vocabulary and a lack of elaboration and detail.

Level 4

4%

Students at this level are distinguished by their ability to analyze material and reason from it. Their well-developed, creative responses contain supportable evidence and appropriate terminology which clarify their ideas.

"Camp out in a forest inhabited by wolves for seven full days and nights in four different seasons (winter, spring, fall and summer), keep track of how many howls you hear at night and during the day. The moon should be full in the fourth night so you can see if it is the full moon causing the wolves to howl."

In their responses to open-ended questions, these students display an understanding of a wide range of scientific concepts, such as the law of conservation of energy, the relationship between volume and the transfer of heat, and the effects of molecular movement. They can organize data and clearly illustrate the relationships among variables. When presented with an experimental situation, they can create a well-conceived design. Their explanations articulate well-developed reasoning, with use of supportable evidence and terminology to clarify their ideas.

GRADE 12 *Science*

The same side of the moon faces the earth at all times. What would happen if the earth orbited the sun in the same way?

Below Level 1

10%

Level 1

38%

Students at this level perform best in a personal context. They have acquired some practical academic skills that are useful in everyday life, but experience difficulty in recognizing the requirements of unfamiliar tasks.

"If the earth moved around the moon like the moon moves around the earth, for one thing one side of the earth would see the moon and the other side would not. The side that sees the moon would have occurrences of eclipses of the moon and sun. One side of the earth would be in total darkness at night. The calendar would change, seasons, also."

Careless observation characterizes many of the written responses of students at this level. They tend to misuse terminology in lieu of explanations. Because they have difficulty organizing and interpreting data, students at Level 1 will arrive at intuitive rather than reasoned conclusions. Their ability to communicate scientifically is minimal.

Level 2

21%

Students at this level are familiar with the major curriculum topics, but have limited understanding of the underlying concepts. Misconceptions or lack of detailed information and analysis characterize their responses.

"If the earth revolved around the sun the way the moon revolves around the earth, half the earth would be dark for half of the year. So days would be half a year long and get very hot and nights would be half a year long and get very cold because the sun wouldn't be warming the land. This would cause problems with the crops."

While the breadth of their factual scientific knowledge is greater than that of students at the previous level, students at this level still experience difficulty communicating or applying concepts. They tend to rearrange rather than reduce data. Although they demonstrate some facility with scientific terminology, they prefer to communicate in vague, non-scientific terms. In response to multi-part questions, or questions that require some depth, students at this level generally provide one answer with minimal support.

Level 3

25%

Students at this level have mastered the secondary school curriculum. They can integrate and apply a broad base of academic knowledge, and can communicate their reasoning competently.

"If the earth moved around the sun the same way the moon went around the earth, one side of the earth would always be light and mostly warm. Then that would mean that the other side of the world would be dark all year. There would also be a problem of growing things on the dark side of the world if the plants and trees don't have sunlight."

When constructing their own response, students at this level are capable of explaining specific situations in terms of underlying principles. They are comfortable with scientific terminology. They understand the scientific method and can apply it successfully, although not necessarily with statistical accuracy. Because they have problems seeing relationships, they can select and organize data but cannot make good inferences from it. Students at this level can address multi-part and multilevel questions with minor errors and incomplete documentation.

Level 4

6%

Students at this level solve problems using a broad and detailed base of knowledge and understanding. They can organize information, analyze it, and generalize to construct new meaning. They are creative, independent thinkers who reason and communicate with power.

"Night and day would no longer exist in all parts of the world. Instead, one side of the earth would have a constant night and the other, opposite side would constantly be in daylight. For starters, the temperatures of each opposing side would differ greatly—one side (daylight) would be unbearably hot and the other dangerously cold. This would have an effect on all living organisms—how they adapted, survived and grew—on either side. It would also greatly affect the weather with snow as opposed to rain, flooding as opposed to blizzards, etc. and it would also affect the terrain of the earth (possible creations of jungles and deserts on the light hot side, creations of ice lands and tundras on the cold side). With all of these changes in mind, the two opposing sides of earth would be 'as different as night and day.'"

The written responses of students at this level reveal a well-developed understanding of scientific concepts across disciplines. They recognize relationships among ideas and can identify subtle but important factors that affect outcomes. They are able to apply scientific methods to specific situations, and understand the need for statistical accuracy. By analyzing data to make reasonable inferences, they reach accurate conclusions. They communicate effectively by using scientific terminology. They provide in-depth and complete answers to complex questions.

GRADE 4 *Social Studies*

Use the information in the chart below to answer each part of this question.

REGION	TYPE OF LAND	AVERAGE HIGH AND LOW TEMPERATURES DURING YEAR	YEARLY RAINFALL (inches)
Region 1	desert	20° – 110°F	under 10
Region 2	plains	30° – 95°F	20 – 40
Region 3	mountains	- 20° – 65°F	10 – 15
Region 4	coastal	70° – 90°F	over 80

A. Which Region is probably best for farming? Use information from the table to explain why you think so.

B. Which Region is best to visit for a vacation? Use information from the table to explain why you think so.

Below Level 1

7%

Level 1

37%

Students at this level are beginning to master the basic facts and procedures of the elementary school curriculum.

"A. Region 1 because it's 20 degrees to 110 degrees and it would be hot and cool. You need sun and rain sometime you need fertilizers. If you pick region 2 your going to drowned the farm. It will get enough rain and water for the farm.

B. I think it should be Region 3. The mountains because you can climb can see goats on top of the mountain up so high maybe even see an avalanche. But watch out, it may fall on you. Blop! Yes, the mountains, that's where I'd go on vacation."

Students at this level have some basic information concerning the world about them, but it is not related into a coherent structure. As a result, their responses tend to be superficial or irrelevant to the requirements of the task. Poor reading or writing skills may also affect their ability to answer adequately.

Level 2

37%

Students at this level can apply basic skills and concepts when presented in familiar contexts. Their answers have minimal content, lacking elaboration or detail.

"Plains because they are flat and good temperature with the sun it would be easy for the farmer to rake, hoe and wheel barrel on flat land. It would be hard to do it on mountains. The reason why I didn't say desert or coastal is because in the desert there's not a lot of water the plants could dry out. And the coastal isn't a good one because they will always be wet too much water can make a plant go flat."

The open-ended responses of students at Level 2 generally remain personal and concrete. They can select appropriate details and use them as evidence. They recognize the effects of change but cannot determine the causes. They have some map reading skills and can identify attributes of different sites. In response to multi-part questions, students at Level 2 seldom are able to answer all parts successfully.

Level 3

17%

Students at this level have mastered the taught curriculum. They observe keenly, think clearly and begin to recognize abstractions. They communicate adequately, with some minor errors.

"A. Region 2 is probably best for farming because the plains have a good temperature and enough rainfall for the crops to grow.

B. Region 4 is probably best for a vacation because the coastal region has an enjoyable temperature and most people like to swim there."

In their written responses, Level 3 students exhibit an objective point of view. They comprehend human geography and have a sense of chronology. They understand the causes of change. They can interpret data and draw simple inferences. Not only do they select and evaluate evidence, but they use it to support positions. Their answers are adequate but lack elaboration and examples that would enrich their responses and indicate strong reasoning skills.

Level 4

2%

Students at this level combine strong critical thinking skills with significant prior knowledge to generate logical, well-supported answers. They communicate clearly, effectively and creatively using appropriate detail.

"A. Region 2 is probably best for farming because the temperature is always right for farming. They also get just the right amount of rainfall. For if the amount was too small, the plants would die of no water. Also, if the amount was too high, the plants would drown.

B. Region 4 is probably best for a vacation because the water is close by to swim and have fun. It's also warm on the coastal plain. Good weather means having a good time. As a matter of fact, there is only one thing that could go wrong. The one thing that could go wrong is rain."

When answering open-ended questions, students at Level 4 go beyond the requirements of the question by synthesizing diverse information and making meaningful generalizations. They can organize and interpret data to make comparisons, draw inferences, and arrive at conclusions. They knowledgeably discuss current events. Their elaborated answers are well-supported and display depth of thought.

GRADE 8 *Social Studies*

Alleged "witches" were severely punished in colonial times.

Thomas Jefferson owned slaves.

The U.S. government took control of lands occupied by Native Americans.

When we study history, we often read about events or situations that seem unjust to us. We wonder how they could have occurred and whether the people in those times believed that they were acting unjustly. Choose one of the events or situations listed in the box above. Write what you know about it. Explain the difference between how we think of the event today and how people thought of it at the time.

Below Level 1

8%

Level 1

39%

Students at Level 1 have mastered most of the basic facts and procedures of the curriculum; however, their understanding is limited to the specific context in which the material is learned.

"The U.S. government took control of lands occupied by Native Americans.

I think it was unfair. The U.S. government wouldn't like it if someone took over the U.S."

Students at this level have some basic information concerning history and citizenship. When asked to construct their own responses, they experience difficulty in comprehending the causes and effects of historical movements and in applying their factual knowledge in unfamiliar contexts. Their knowledge appears to remain at the "taught" level and their decisions are based on personal experience.

Level 2

26%

Students at Level 2 possess much of the knowledge and skills typical of the curriculum, but have difficulty applying that knowledge. Although generally correct, their responses are minimal, lacking support or adequate explanation, or are marred by major misconceptions.

"Thomas Jefferson owned slaves because of the fact that it was usual then. He grew up knowing slavery and was used to it. Back then, slavery was big business and they did not require paychecks. Today, we know that all men are equal and should not be treated in such ways. Slavery is unconstitutional and is evil. There is no excuse for slavery whatsoever."

Students at Level 2 can make simple inferences from material that is presented to them; however, they experience difficulty in marshaling ideas and information to construct their own arguments. They also find it hard to shift viewpoints. As a result, their written responses tend to fall back on moral absolutes as reasons and are typically characterized by their brevity.

Level 3

22%

Students at this level recognize the underlying concepts of the curriculum and can apply their learning to new contexts. They reason well and communicate adequately.

"Alleged 'witches' were severely punished in colonial times. The most famous of which is probably the Salem Witch trials of Salem, Massachusetts.

People back then were afraid of what they didn't know or understand. If something came up that seemed unusual, they would accuse the person of being a witch.

Today we look at that as cruel and unusual punishment. We know the people back then acted wrongly. Today we know no such thing as witchcraft."

Students at Level 3 are fluent readers who can interpret material presented in unfamiliar formats. When asked to construct their own responses, they structure arguments and recognize contrasting perspectives when the material is familiar to them (e.g., environmental issues). They are willing to explore divergent points of view. In response to less familiar topics, their lack of detailed knowledge limits the effectiveness of their arguments.

Level 4

5%

Students at this level are distinguished by their ability to analyze material and reason from it. Their well-developed, creative responses contain supportable evidence and appropriate terminology which clarify their ideas.

"Witches in colonial times were women and a few men that were thought to have secret powers. Most people did not like the supposed witches and tried to get them killed or punished. They were accused of going into people's minds and making them see certain visions or say or do certain things.

A lot of people now realize that the witches were used as a form of scapegoating. If someone did not like a person, they could say that they had seen visions of the person that they didn't like. Most likely judges would put witches in jail or hang them because they were so afraid. However, we still have fears and prejudices against other people and their cultures such as the fear of communism in the 50's which started the McCarthy trials and ruined hundreds of innocent lives."

The most typical characteristic of Level 4 students is the ability to generalize from the given facts. For example, when discussing a political cartoon, they relate the cartoonist's message to larger social and ethical issues. As above, they cogently describe how the same event can be judged differently when examined from a historical perspective. Asked to review a current political situation, they cite positive and negative arguments and arrive at reasoned conclusions. They are thoughtful readers, attentive to details and subtleties.

GRADE 12 *Social Studies*

Country	Gross National Product (per person)	Infant Mortality	Life Expectancy Male	Life Expectancy Female	Murder	# of Students per 100,000 Inhabitants	Circulation of Newspapers per 1000	TV sets per 1000
A	$23,325.00	5	75	81	1.20	1,971	562	585
B	$19,815.00	10	72	79	8.60	5,142	268	813
C	$5,311.00	70	62	65	1	1,091	59	83

Based on the information in the table and your knowledge of different countries in the world, what real countries might Country A, Country B, and Country C be? Defend your choices using the information in the table. Your answer will be judged on your reasoning and how well you use all the data in the table.

Below Level 1

9%

Level 1

41%

Students at this level perform best in a personal context. They have acquired some practical academic skills that are useful in everyday life, but experience difficulty in recognizing the requirements of unfamiliar tasks.

"Country B would sound the most reality to me. A country with the Gross National Product of 19815.00 would most likely have life expectancy 72-79. Because I find if a country is that crowded you wouldn't be expected to live long. This must be a small country."

Students at Level 1 have accumulated a store of discrete facts about the history and structure of society. When presented with the open-ended format, they show little or no understanding of important concepts and are unable to connect ideas or apply them.

Level 2

21%

Students at this level are familiar with the major curriculum topics, but have limited understanding of the underlying concepts. Misconceptions or lack of detailed information and analysis characterize their responses.

"I think A would probably be Russia because there are so many jobs over there in factories, corporations, partnerships that make it Europe's largest money making country.

B would have to be the United States because of the murder rate being so high and life expectancy is big.

C would be somewhere in Africa because of the infant mortality rate being so high."

Students at Level 2 have a minimal understanding of important concepts. This is evident in their responses to open-ended questions. Typically, they give a scant or incomplete response that is characterized by lack of evidence or inappropriate evidence.

Level 3

25%

Students at this level have mastered the secondary school curriculum. They can integrate and apply a broad base of academic knowledge and can communicate their reasoning competently.

"Country A or B, would be a country such as the U. S. or Japan where there is a high Gross National Product rate. The infant mortality is low and life expectancy is high due to good hospitals and new technology. Country C would be a country like U.S.S.R. where people don't spend as much time at home, murder is low, income is low because everything is controlled by the government."

In response to the open-ended questions, Level 3 students marshal information from many sources to produce a well-developed reply. Presented with unfamiliar graphs and charts, they recognize and integrate detailed and vital information as well as interpret its meaning. They then use that information to make generalizations. Though adequate, their responses lack elaboration and enriching detail.

Level 4

5%

Students at this level solve problems using a broad and detailed base of knowledge and understanding. They can organize information, analyze it, and generalize to construct new meaning. They are creative, independent thinkers who reason and communicate with power.

"Country A is a nation with a fairly high standard of living, as shown by the Gross National Product. The number of televisions and newspapers indicate that the inhabitants are fairly well informed. The low infant mortality rate and long life expectancy show that the nation is healthy. The low number of murders reveal that citizens are generally law-abiding. Based on this knowledge, I would have to say that this country may be Japan.

Country B is also in good standing. Like Country A, it has a good standard of living. More people have TV's and less have papers but they are still informed. Due to the high number of students, it is obvious that many people continue education. The number of murders is deplorable, however. I believe that this country could be the United States.

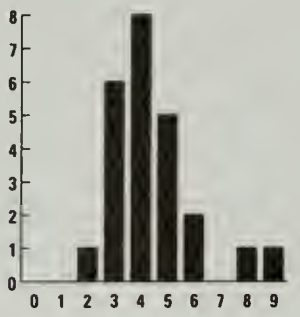
Country C has a lower standard of living. The people are not as healthy. They also do not have as good a grip on current events. The low murder rate shows that they are not as given to committing crimes. I would say that this country may be the former Soviet Union."

In responding to open-ended questions, Level 4 students can be characterized by their insight. Within a set of passages, they recognize large themes, see implications, integrate new information with their prior knowledge, and use that knowledge to broaden, elaborate, and enrich explanations. They discern and explicate opposing points of view and regard situations from multiple perspectives.

GRADE 4 *Math*

Karen and her fourth grade classmates used information about themselves to make the graphs below. Look carefully at these graphs and answer the questions that follow them.

①



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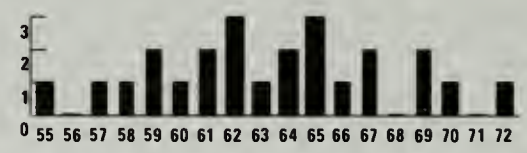

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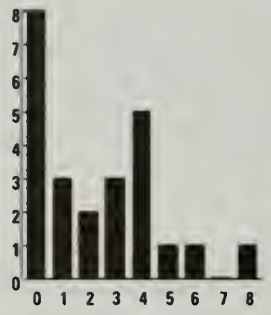
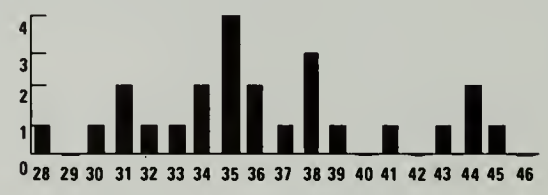


④



A. Which graph shows the weight in pounds of fourth graders? Explain why you think so.

B. Which graph shows the shoe sizes of fourth graders? Explain why you think so.

C. Choose ONE of the other graphs and explain what you think it might describe and why. Be sure to tell which graph you are describing.

Below Level 1

6%

Level 1

38%

Students at this level are beginning to master the basic facts and procedures of the elementary school curriculum.

"A. I think the graph three is the weight. Because it has a lot of height marks on it. So that's why I think its one of the weights.

B. I think it's graph 4. Because its like the lowest numbers out of all the graphs. So that's why I think its the shoe sizes for the fourth grade.

C. I think graph one shows how tall the people are in the class."

Level 1 students experience difficulty when asked to respond to open-ended questions. Although they may perform simple, computational problems well, they fail to apply their knowledge in less familiar contexts. When presented with problems, they show some understanding of what is required, but do not use a reasonable approach.

Level 2

39%

Students at this level are adept at using basic skills and concepts when presented in familiar contexts. Their answers have minimal content, lacking elaboration and examples.

"A. Graph 2 because it looks appropriate weights for fourth graders, the rest don't.

B. Graph 4 because fourth graders can't be 8 feet tall.

C. Graph 3. I think it could be the people in the fourth grade classes."

In response to open-ended questions students at Level 2 show evidence of some conceptual understanding; however, they have a limited ability to express themselves verbally. Although they can read charts and graphs, they cannot generate their own interpretations of the data. These students seldom go beyond a minimally acceptable response to the problem presented.

Level 3

15%

Students at this level have mastered the taught curriculum. They observe keenly, think clearly and begin to recognize abstractions. They communicate adequately, with some minor errors.

"A. I think that the graph that shows the pounds of 4th graders is graph 2. I think this because the numbers look like weights.

B. I think that the graph of the shoe sizes is graph 3 because its the only one that looks like shoe sizes and more numbers of kids.

C. I think graph 4 shows how tall the kids are Because it looks like heights of something so I thought it was kids heights."

In responding to open-ended questions students at Level 3 recognize the application of mathematics to everyday situations. They can construct and use diagrams, tables and charts to solve problems. They recognize appropriate strategies; show clear understanding of mathematical concepts; and provide sound arguments in support of their answers.

Level 4

2%

Students at this level combine strong critical thinking skills with significant prior knowledge to generate logical, well-supported answers. They communicate clearly, effectively and creatively using appropriate detail.

"A. I think graph 2 shows how much a fourth grader weighs. The students would have to be babies if 1, 3, or 4 showed their weight. Most kids in my class weigh from 55-72.

B. I think that graph 1 shows the shoe size of fourth graders. Lots of 9 and 10 year olds wear shoes for 2 - 9. I wear a size 5. It couldn't be graph 3 because there is no such thing as size zero.

C. Graph 4 might show how old the fourth grade students' parents are. 28 years old might be a little young though to have a child in the fourth grade."

In response to the open-ended questions Level 4 students effectively communicate mathematical concepts using mathematical language. They provide fully developed examples; construct strong, appropriate arguments; and use a variety of methods to illustrate their comprehension. Their close attention to details allows them to achieve a higher level of accuracy than the previous groups.

GRADE 8 *Math*

Your neighbor wants to hire you to paint the walls of his living room, which measures 12' by 15'. The room has an 8' ceiling, three windows, and a door. You know that one quart of paint will cover 80 square feet.

A. Estimate the amount of paint needed to complete this job. Explain your reasoning.

B. You are asking for $100 for the job. Your neighbor thinks that amount is too much. Your expenses (paint, brushes, tape, drop cloth, etc.) must be taken from this amount. Paint costs 5.95 per quart or $21 per gallon. You think it will take you 6 hours to complete this job. Write a letter to your neighbor convincing him that $100 is a reasonable payment for the job.

Below Level 1

8%

Level 1

39%

Students at this level have mastered most of the basic facts and procedures of the curriculum; however, their understanding is limited to the specific context in which the material is learned.

"A. I think the answer is two quarts, I don't know why I just guessed.

B. Dear Neighbor,

I think that $100 dollars is a good amount of money to paint your living room. The reason I say this is because I have to buy a lot of stuff just to paint your house so I have to spend a lot of money. So 100 dollars is what I want and if you can't give it to me, then I won't paint your living room."

When presented with open-ended questions, students at this level apply a trial-and-error strategy to solving simple problems, but experience difficulty in interpreting problems presented in unfamiliar format or contexts. They fail to recognize the requirements of the task or the relevance of their mathematical knowledge.

Level 2

32%

Students at this level possess much of the knowledge and skills typical of the curriculum, but have difficulty applying that knowledge. Their responses are minimal, lacking support or adequate explanation.

"A. You would need about 2 1/4 quarts of paint to paint your neighbors living room. You would because his living room measures 12' by 15'.

B. Dear Neighbor,

I think $100 is a reasonable payment for the job. I think you should pay me $100 because it will take around 6 hours to complete the job and all the supplies are a lot of money also.

You can do what you want but I think around $100 is a good pay. Think about it."

When presented with open-ended questions requiring numerical reasoning, students at Level 2 are willing to attempt unfamiliar or complex problems, but they often do not recognize the relationship between the elements involved and find it difficult to express their reasoning.

Level 3

19%

Students at this level go beyond the taught facts and procedures of the curriculum to recognize underlying concepts. They can analyze and evaluate material presented in new contexts and can apply their learning. They reason well and communicate adequately.

"A. You would need about 6 quarts of paint to cover the space. If you have 432 square feet and divide it by 80, you get 5 r. 32, so that's how much you need.

B. Dear Neighbor,

$100 is a very reasonable amount for my work because if it takes me 6 hours to do this job, then it will cover all my expenses nicely and you will have a beautiful wall to look at. If a professional came in, you would probably have to pay more."

Level 3 students understand the requirements of the problems and make good attempts at solutions. When problems are straightforward, such as interpreting and synthesizing data from graphs and charts, they are able to form reasonable conclusions. However, they find it difficult to organize complex data and usually fail to consider some important variables.

Level 4

5%

Students at this level are distinguished by their ability to analyze material and reason from it. Their well-developed, creative responses contain supportable evidence and appropriate terminology which clarify their ideas.

"A. I have estimated that approximately five or six quarts or 1 1/2 gallons are necessary to completely paint the living room. The room measures 12' by 15'. This means two will have a length of 12' and a height of 8'. The other two walls are at a length of 15' with an 8' ceiling. There will be leftover paint because the windows and door aren't painted.

B. Dear Neighbor,

After careful considerations of my calculations, I believe that a hundred dollar wage would be very reasonable. Buying paint alone will cost me over thirty dollars plus I have other expenses. The job will take almost six hours. I ask you to reconsider your deal and allow me to complete a job well at a reasonable price."

In addition to their numerical proficiency and geometric knowledge, these students display a well-ordered, reasoned approach to problem solving. When presented with complex word problems, they apply a variety of solution strategies, including the organization of data into charts and graphs. They understand and use appropriate symbolic representation, and can explain their reasoning with clarity and precision.

GRADE 12 *Math*

Job A	Job B	Job C
$1000/month 15% increase at six months Salary review at one year	$275/week 5% increase at 16 weeks 5% increase at 32 weeks	$8/hour, 30–40 hrs./week after 6 mon., guaranteed 35 hr./wk. after 1 yr., guaranteed 40 hr./wk., with 1-1/2 for any overtime

The chart above shows three job offers which you have received. Which job offer is the best and why?

Below Level 1

12%

Level 1

37%

Students at this level perform best in a personal context. They have acquired some practical academic skills that are useful in everyday life, but experience difficulty in recognizing the requirements of unfamiliar tasks.

"Job B is the best offer because you make more a month than Job A and you don't seem to work as much as Job C."

Students at this level often fail to recognize the relevance of mathematics to a task. Their approach is holistic and uncritical, as they apply personal reactions rather than analysis to problem situations.

Level 2

24%

Students at this level are familiar with the major curriculum topics, but have limited understanding of the underlying concepts. Misconceptions or lack of detailed information and analysis characterize their responses.

"Job A seems the best to me for although you do not start with as much pay as in job B you get an increased salary of approximately 37.00 a week after six months. This would allow you to make around 287.00 a week which is more than the 280.50 you would be making in 32 weeks. Also there after one year there is a review of your salary."

When presented with open-ended questions, Level 2 students demonstrate a minimal understanding of the tasks and an incomplete understanding of the concepts involved. Although they can answer questions at a mechanical level, they are unable to apply and connect their knowledge to real world situations. When presented with a complex or multi-part problem, they fail to consider all the information or recognize its relevance. Consequently, they experience difficulty in communicating their reasoning.

Level 3

20%

Students at this level have mastered the secondary school curriculum. They can integrate and apply a broad base of academic knowledge and can communicate their reasoning competently.

"When looking to find a job there are many things that should be considered. With the information provided, I can base my decision only on salary. To figure the salaries for the first year I have used the space below...

Job A $12,900 yearly salary, job B $15,083 yearly salary; job C $13526 minimum salary and $15606 maximum salary.

If I were to make the decision on which job, I would take B; it guarantees the most amount of money for one year."

In response to open-ended questions, students at Level 3 are able to recognize the relevant concepts in a problem and to make obvious connections within mathematics itself or with other areas. They are able to partially explain their reasoning and can adequately communicate in mathematical terms. While their problem solving may not be fully complete or explained, they do show the ability to apply mathematical skills, reason mathematically, and work in the abstract.

Level 4

7%

Students at this level solve problems using a broad and detailed base of knowledge and understanding. They can organize information, analyze it, and generalize to construct new meaning. They are creative, independent thinkers who reason and communicate with power.

"If the jobs offered to me, I feel that Job C is the best offer. You see, Job A would give me $12,900 a year and even if A got another 15% pay raise at the end of the year, I still wouldn't be making what Job C pays me. Job B, on the other hand, would give me $13,871 per year and steady pay increases, but I still would choose Job C. You see, with Job C I would be making a minimum of $13500 per year and a maximum of $16640 per year. Although minimum pay is slightly less than Job B, the maximum pay is a good deal more than Job B's. Also with Job C,, within a year I'd be guaranteed 40 hours a week ($16,640 per year) plus time and a half for any overtime, thus giving me an overall higher salary than Jobs A and B within a year. Mind you, my decision was not based on the many other factors involved such as location of the job, type of work and health benefits, etc."

Students at this level solve complex word problems that cannot easily be translated into simple algebraic equations and are not typical of those found in textbooks. They are able to extend beyond the obvious connections to the less obvious, more abstract generalizations. This self-confidence and intellectual flexibility is evident in their divergent problem solving strategies, as well as in the effectiveness and accuracy of their problem solutions.

GRADE 4 *Writing*

Students were asked to discuss at least three things necessary for human life on another planet and explain why each is necessary.

Below Level 1

6%

Level 1

26%

Students at this level are beginning to master basic skills in communication.

"Well thay should put houses when you do on earth. and it should be clean and healthy. and it should have lost of safty to go there"

Students at this level approach writing tasks as they would a worksheet; although relevant, their responses tend to be minimal, usually limited to a single sentence. If they use more than one sentence or idea, there is no attempt to connect them in logical sequence. Ideas are expressed in vague terms with few specific details and little elaboration.

The responses of students in proficiency Level 1 exhibit a disproportionate number of errors in surface features (spelling, punctuation, capitalization and usage). These errors may be so numerous as to interfere with the reader's ability to understand the text.

Level 2

46%

Students at this level can communicate ideas using simple structure and language.

"Things the planet must have for people to live in it is, air so people can breath, good soil so people can have food. Water so people can drink and water the plants, and a sorce of heat (the sun) to keep people warm."

Students at this level go beyond the simple one-sentence responses that characterize students at Level 1. Their paragraphs show rudimentary development consisting of predictable, simple sentences with unelaborated or repetitious details. There is some attempt at organization; however, traditional organizational features, such as topic sentences and conclusions, are missing. In their arguments, these students attempt to show a progression of thought, but there are lapses or shifts in logical development. Like Level 1 students, they use very simple language which is not always appropriate for the topic.

In general, students at Level 2 display more control over the mechanics than do students in Level 1. They lack skills in the areas of topic development, organization and detail.

Level 3

19%

Students at this level can communicate adequately using a logical organization and appropriate details.

"If people live on planets the planets would need a lot of food and water. Planets need these things because some planets can be dangerous. The most important, you need water to survive because you can't live without water.

You also need warm clothing because you don't now if the planet is cold cool, warm or hot. Because can probably die if you don't wear warm clothes on a freezing cold planet.

You also need oxygen which comes from what we need for food. Of course we get oxygen from plants. Planets need a lot of plants in order to get a lot of oxygen. So if you ever live on a not so good planet, you'll need all of these things."

Students at Level 3 are beginning to show a sense of audience and can adequately communicate their knowledge and ideas. They respond to questions with a topic sentence and go on to develop their ideas sufficiently. They use complex sentences with predictable structures. They have an awareness of paragraph formation, although lack complete command.

These students understand the need for support and provide details appropriate to their conclusions. In addition, their writing involves interpretation as well as exposition, signaling the beginnings of abstract thought. Some errors in surface features are found in students' work, but they do not interfere with the reader's ability to understand the text.

Level 4

4%

Students at this level communicate clearly and effectively with their audience, expressing themselves with a sense of style and voice.

"For people to live on a planet, the planet must have oxygen for people to breath. If we can not breath for to long, our heart will stop pumping blood.

A planet which people live on must also have sunlight. Sunlight helps the vegetables, which we need to eat. Sunlight also helps our bodies produce vitamins.

Finally, a planet must have water for living things to survive. We must have water because it has vitamins in it. Plants need water to make food, and we eat plants. Those are three elements that a planet must have for people to live on it."

Students at Level 4 use an effective variety of sentence structure and length. They support their main idea with interesting and pertinent details and rich language. Their transitions, not only from sentence to sentence, but also from paragraph to paragraph, are smooth, sound and logical. By establishing and maintaining a purpose, these writers construct a logical progression of ideas that leads to sophisticated conclusions.

Some surface errors may be found, but they do not detract from the writer's ability to communicate.

GRADE 8 *Writing*

Students were asked to tell what they knew about a historical event and to comment on the modern perspective of that event.

Below Level 1

9%

Level 1

27%

Students at this level show some basic skills in communication.

"Witches were treated unfairly back then because if they were guilty or innocent they would die anyway, today we think that witches weren't as bad as they thought. I wouldn't kill a person just because some person told me that someone was a witch."

The responses of students at Level 1 are characterized by their brevity, often limited to a single run-on sentence. When these students give more complete answers, their sentences often do not follow a logical progression. Their language is simplistic, and their poor control of surface features (mechanics, grammar, spelling) often interferes with the reader's ability to understand the piece.

These students lack a sense of audience and experience difficulty in judging the requirements of the task. Their responses tend to be concrete and personal, incorporating accounts of how their lives relate to the question.

Level 2

42%

Students at this level can communicate adequately but lack command of organization and sentence structure.

"The U.S. Government took control of lands occupied by Native Americans and that was wrong. Native Americans were the first people to settle in the new world (that's what I believe) and that's very wrong to kick them off their property.

I'm sure the government didn't care about them all they wanted was there land."

Students at Level 2 are able to communicate in a rudimentary fashion. They attempt to organize their responses in order to communicate with the reader and give fuller, more complete responses than students at Level 1. Using contextual evidence, these students are able to provide support for their arguments, but their responses lack cohesion and completeness. Surface and syntax errors also interfere with the reader's ability to understand their writing.

Level 3

18%

Students at this level can communicate effectively, using conventional organization and appropriate details.

"In our history, many women have been tortured and killed for various unjust reasons. One of the most severe periods of this was the Salem witch trials. People seemed to believe that if anything went wrong it was a witch that had brought upon an evil curse. For instance, if a strange woman walked by while they were churning the butter and later on the butter was found to be sour they would blame the woman as 'witch' and she would be punished or often put to death. When a witch trial was held the woman being tried hardly had a chance to defend herself and she was almost always condemned.

Today our country has come to realize that many of the women were truly innocent. 'Witchcraft is now commonly considered a religion and many people cease to believe in any form of supernatural power. but I personally believe in witches! "

Students at Level 3 communicate effectively, providing developed responses. Formal and objective language as well as conventional organization indicate an awareness of the intended audience. They prioritize their ideas, with the main point(s) supported by appropriate, relevant details. Their writing often benefits from a more comprehensive knowledge of the subject and a correct use of vocabulary. Errors in surface features are never great enough to interfere with communication.

Level 4

4%

Students at this level communicate with clarity and effectiveness, expressing themselves with a sense of style and voice.

"The U.S. government took control of lands occupied by Native Americans. Often in the course of U.S. history as the settlers were moving further and further west, many Native Americans were taken from their own lands and set to live on reservations. One of the most tragic of these movements of Native Americans was the 'Trail of Tears.' Many Native Americans were forced to walk hundreds of miles to new lands. Many died. Some died because the government gave them blankets with diseases such as small pox. Treaties were often made with Native Americans promising them that they could keep the land given to them, but more often than not, they were broken when valuable minerals were found in such places as Oklahoma and the Black Hills of South Dakota.

People today find those events appalling and unthinkable. But many years ago, it was a way of life and the U.S. citizens felt justified in their cause."

Students at this level write with an awareness of the reader and, when appropriate, a distinct voice. Their responses are well organized, both conceptually and structurally. Different components of their response are clearly demarcated in paragraph form, with an overall coherence. They develop their topics subtly and with perception. They use effective language and a well-developed vocabulary, as well as including rich, interesting details that enhance their discussion and maintain their purpose.

GRADE 12 *Writing*

(Students were given drawings of two plants: one was taller, with large leaves and short roots, the other was shorter with long roots and small leaves.)

The two plants shown above are the same species and about the same age. Describe the environment where each plant was found and how the plant adapted to its environment.

Below Level 1

14%

Level 1

24%

Students at this level show some basic skills in communication.

"The plants were found in different places plant B was found a mile away from plant B. They adapted to its environment by the way the ground had vitamins and minerals and how much water each get. A plant to grow nice and healthy needs light and Air too."

The responses of students at this level are generally so brief that they make development and support impossible. When Level 1 students write more than a few sentences, their lack of control over topic development, organization, and details renders written communication difficult. Often the responses of Level 1 students exhibit a disproportionate number of surface errors (mechanics, grammar, spelling, and usage) which interfere with the reader's ability to understand the piece.

Level 2

34%

Students at this level can communicate adequately using simple structure and language, but lack command of writing techniques.

"Plant A looks like it is in a good environment. It has plenty of sun and rain. The soil must be very rich since it does not have to go so deep in the ground. Plant B has to dig in more deeply into the soil to get mineral and water so it must be in a not so good environment probably it does not have enough sun and water to grow at it full potential. Therefore plant A will grow faster, healthier and better than Plant B."

Students at Level 2 attempt to organize their responses to communicate but are not always successful. They show evidence of adhering to general fundamentals of writing such as logical topic development and organization, yet they lack the skills to implement what they know. Often, they are unable to stay on the main topic as evidenced by abrupt lapses in organization. Their sentences are repetitive and their language is simplistic. There may be an inordinate amount of surface errors.

Level 3

22%

Students at this level can communicate effectively, using conventional organization and appropriate detail.

"Plant A was in an environment that received a good amount of precipitation. It's roots aren't very branched and are short because they could get enough water from a small amount of space. It also was sunny in this climate because the leaves are large and the stem is tall.

Plant B was in a climate that received less precipitation than Plant A. The roots had to cover a large area and were very branched in order to obtain enough water. The short stem and small leaves also show that water was not so plentiful that it could be put into other parts of the plant."

Students at Level 3 communicate effectively. Their responses reflect a consideration of the audience; they elaborate and clarify their main points for the sake of the reader. The development and organization of their responses indicate understanding of the requirements of the task. They handle the textual details efficiently and appropriately. Their sentence structure is correct but predictable; their word choice is appropriate but unimaginative.

Level 3 students may have some errors in surface features, but those errors are never great enough to interfere with communication. They have control of the mechanics of writing.

Level 4

6%

Students at this level communicate with clarity and effectiveness, expressing themselves with a sense of style and voice.

"Plant A is found in a moist, crowded, tropical or temperate forest. Because there is plenty of rainfall, plant A has short roots and no problem obtaining water which it will use for life functions. The broad leaves help catch rainwater as it falls and its height has increased in order to compete for sunlight with the plants surrounding it. The plant needs light in order to produce its food through photosynthesis.

Plant B is a short plant with a vast network of roots. Plant B would typically grow in a spare arid land. The long roots indicate that Plant B needs to obtain moisture and nutrients trapped deep in the soil. Plant B has no competition for sunlight so it does not need to grow very tall. This stocky, compact shape helps it reduce evaporation of precious water. Also, the plant's compact shape and long root system indicate that it might be located in a very windy spot. The roots would anchor the plant to the soil and the small size would prevent the wind from catching it."

The writing of students at this level indicates a sense of purpose that embraces the audience. At this level, the writer's voice emerges from the text through manipulation of structure, use of literary devices, and choice of language. Level 4 students develop their topics subtly and with perception. A variety of sentences, as well as rich vocabulary, characterize this level of writing. They manage the details of the text in such a manner as to elaborate on the answer and enhance the reader's enjoyment.

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